ROYAL BOTANIC GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

No. 10.] [1907.

LVIII.—THE GUMS AMMONIAC OF MOROCCO AND THE CYRENAICA.

(*Ferula communis*, L., var. *brevifolia*, Mariz ; *Ferula marmarica*, Aschers. and Taub.)

OTTO STAPF.

The origin of the Gum Ammoniac of Morocco has, in spite of repeated attempts to clear it up, remained doubtful. On Lindley's authority it is very generally accepted as the resin of *Ferula tingitana ;* but Battandier * suggested already in 1889 that it was the produce of a form of *Ferula communis* which he called "*β gummifera*," and later Simmonds † came to a similar conclusion. Further, in 1892, Sir Joseph Hooker‡ pointed to *Ferula Linkii* as the probable source of the gum. He was led to this assumption by some specimens, then in cultivation at Kew, of a *Ferula* which had been received from Morocco as representing the mother plant of the gum ammoniac ; but as those specimens had not then flowered, an exact determination was not possible. They did so, however, before the year was over, and a drawing was made, which has been reproduced quite recently in the *Botanical Magazine*, tab. 8157. With its identification as a form of *Ferula communis*, the question as to the botany of the Morocco gum ammoniac is settled, and it is now possible to give a fairly complete account of the history of the drug. The early history of this gum, however, has been so obscure up to the present time that it will be necessary to deal first with its most recent phase. Having done that we shall be in a better position to interpret the very meagre accounts of earlier authors, and the relationship of the Morocco drug to the once so highly reputed Ammoniakon of Dioscorides.

* Battandier in Battandier and Trabut, Flore de l'Algérie, vol. i. p. 367.
† Simmonds in Amer. Journ. of Pharm. 1891, p. 76.
‡ Hooker fil. in Bot. Mag. tab. 7267.

1375 Wt 87 10/07 D & S 29 30018

Recent History (from the beginning of the 19th century) of the Gum Ammoniac of Morocco.

The first to call attention to the gum ammoniac of Morocco as a distinct drug was J. G. Jackson, in his "Account of the Empire of Morocco," published in 1809. In a second edition, published in 1814, the following account occurs on p. 136: "*Ammoniacum*, called *Feshook* in Arabic, is produced from a plant similar to the European fennel, but much larger. In most of the plains of the interior, and particularly about El Araiche, and M'sharrah Rummellah,* it grows ten feet high. The Gum Ammoniac is procured by incisions in the branches, which, when pricked, emit a lacteous, glutinous juice, which being hardened by the heat of the sun, falls on the ground, and mixes with the red earth below: hence the reason that Gum Ammoniac of Barbary does not suit the London market. It might, however, with a little trouble, be procured perfectly pure, by spreading mats under the shrubs to receive the gum as it falls. The gum in the above mentioned state, is used in all parts of the country for cataplasms and fumigations. The sandy light soil which produces the Gum Ammoniac abounds in the north of Morocco. It is remarkable that neither bird nor beast is seen where this plant grows, the vulture only excepted. It is, however, attacked by a beetle having a long horn proceeding from its nose, with which it perforates the plant and makes the incisions whence the gum oozes out." This description is accompanied by two plates, one representing a leaf (or portion of a leaf), and a fragment of the stem, whilst the other shows the insect† connected with the production of the resin.

Sprengel in his *Species Umbelliferarum minus cognitae* (1818), p. 88, ventured to refer Jackson's plant to *Ferula orientalis*, "although Jackson's figure is not perfect." Twenty years later the plant was met with again by Lieut. Washington, R.N., who mentions it repeatedly in his diary of a journey from Tangier to the City of Morocco and back.‡ Thus, on page 127, he records "plants like fennel, called el clagh (gum ammoniac)" from the country to the south-west of El Ksar, and "a forest of el clagh (gum ammoniac); some plants ten feet high, stem five inches thick," from the narrow strip of land between Murja Ras ed Dowra and the sea. Then again on p. 151, he mentions "that gigantic annual also, the gum ammoniac plant, like fennel, already putting forth its shoots and feathery leaves," in the plains

* East of the lake Murja Ras ed Dowra.

† Jackson calls the insect 'Dibben Fashook.' Dr. Charles Waterhouse informs me that it has not yet been identified. He believes it, however, to be a carpenter bee (*Xylocopa*). Mr. Horace P. White (*see* p. 379) made efforts to obtain the insect, but writes that it has not been observed on the gum ammoniac plants near Rabat. Jackson's account of the insect reads very like that by Aitchison concerning the puncturing of *Dorema* by boring beetles and the subsequent exudation of resin. Other *Umbelliferae* are also attacked in this way, but though the flow of the resin may be stimulated by the boring of those insects, its production of course does not depend on their presence. Any wound, as for instance one caused by tapping, would have the same effect.

‡ Washington in Journ. Geogr. Soc. I., 1830.

between Wadi Umer Rebia and F'dalah. The first two observations are dated 14th and 15th of November, and 16th of November respectively, the last January 15th to 21st.

Lindley accepted Sprengel's identification of the plant yielding the gum ammoniac of Morocco. In *Flora Medica* (1838), p. 46, he says in a note on *Ferula orientalis* : " What is supposed to be this plant yields in the State of Marocco a gum resin similar to Ammoniacum ; whence it has been thought to be really the origin of that substance, and I think with good reason, so far as the drug of Dioscorides is concerned " ; and in 1846 he repeats this view in his *Vegetable Kingdom* (ed. I., p. 776) : " *Ferula orientalis*, which still furnishes a drug of the kind (*i.e.*, of Gumm ammoniac) in the Kingdom of Marocco." The same passage also occurs in the third edition of the *Vegetable Kingdom*, published in 1853 ; but in the same year, Pereira, in his *Materia Medica* (vol. III., p. 1715) inserted a note by Lindley—here reproduced—in which the mother plant of gum ammoniac is referred to as *Ferula tingitana* :—" I am indebted to Dr. Lindley for a fine sample of African Ammoniacum (Ἀμμωνιακόν, Diosc.). It was sent by W. D. Hay, Esq., the British Consul at Tangier, to the Hon. W. T. Fox Strangways, and is marked, 'Gumm Ammoniac or Fusògh, Tangier, 17 June, 1839, J. W. D. H.' It is an oblong piece, about three inches long, and one-and-a-half inches thick, and broad. Its weight is about 830 grains. Externally it is irregular and uneven, and has a dirty appearance, similar to what ammoniacum would acquire from repeated handling and long exposure to the air in a dusty situation. It is partially covered with paper. A few pieces of reddish chalky earth (which effervesces with acids) are found sticking to it, thus confirming the account given of it by Jackson, though the quantity of this on my specimen is not sufficient to affect in any way the saleability of it. It appears to be made up of agglutinated tears, like the lump Persian ammoniacum. Internally it has very much the appearance of lump ammoniacum, but is not so white, but has a brownish, reddish, and in some places a faint bluish tint. Its odour is very faint, and not at all like Persian ammoniacum. Heated on the point of a knife, its distinction from Persian ammoniacum is very obvious. Its taste is also much slighter than that of the commercial ammoniacum. Rubbed with water, it forms an emulsion like the latter. It is the produce of *Ferula tingitana* (Lindley)."

What may have induced Lindley to change his opinion is not quite clear, unless he had found out that *Ferula orientalis* was not a native of North Africa, whilst *Ferula tingitana* was indigenous in Morocco, and in fact was, at that time, the only species of *Ferula* known from that country ; but then Jackson's figure of the Fashook plant should have been sufficient to make this identification at least highly doubtful. However that may be, Lindley's last view has been adopted by most subsequent writers.

Meanwhile Hanbury* had on several occasions received samples of Morocco gum ammoniac, some of which had been

* Hanbury in Journ. Pharm. Soc., March 22nd, 1873, p. 741 ; Science Papers, pp. 375–379.

imported from Mogador, and having enlisted the services of his friend Dr. Leared, he ascertained through him the following particulars* : "The plant is called *Kelth*, and grows up rapidly after the first rains. Its gum is not much shipped to Europe, but a great deal of it is taken by pilgrims to Egypt and Mecca, where it is used as incense. Its chief shipping port is Mazagan ; a little is sent from Mogador, but none from other ports. The *Greatham Hall*, the vessel in which Dr. Leared embarked, took on board 25 serons of the gum at Mazagan for Gibraltar, where they were to be reshipped for Alexandria. The shippers call it *Fasoy*." Dr. Leared also procured rootstocks of the plant for the Botanic Gardens at Kew and Regent's Park, but they did not grow.† In his book "Marocco and the Moors" (1876), Leared also mentions (p. 356) the plant, and says that he was informed that the Fashook plant grows at a place two days' journey from Mogador, on the road to the city of Morocco. Referring to this statement Sir Joseph Hooker,‡ however, remarks : "We, on the other hand, were persistently assured that it grew nowhere along that route, nor nearer to it than El Araiche, north of Marocco city. And this is confirmed by information obtained by Mr. R. Drummond Hay to the effect that it is found near Marocco, and chiefly around Tedla. The Moors who gave us this information at once recognised the figure by Jackson, and called the plant Kilch (Kelth according to Leared)."

Dr. Leared's account is of so great interest that it has seemed worth while to reprint it almost in full. In the second edition of his book (1891), p. 345, he refers to the gum as follows:— "FASHOOK — *Ferula* species — Gum ammoniac. Called Fasoy by the European merchants and Kelth by the Moors. It is abundant in Woled Bu Sba, two days' journey from Mogador, on the road to the city of Marocco. It grows very quickly after the first autumnal rain. A stalk obtained at Mogador was one inch and a quarter in diameter. Before parting with it the Moor broke off a portion, intending, as he said, to fumigate his sore eyes. Some roots procured by Signor R. Elmaleh were of the size and shape of carrots, of a blackish-brown colour, and studded over with numerous warty projections. When broken they exuded drops of milky juice which formed yellowish-white opaque tears. The taste of this gum resin was slightly bitter, with considerable acidity. A single fennel-like leaf accompanied the roots—it was evidently the leaf of an umbelliferous plant. It was found that the taste of this gum resin differed from that of a specimen of African Ammoniacum in the museum of the Pharmaceutical Society. . . . It seems probable, therefore, that African Ammoniacum is produced by more than one species. . . . On account of its adhesiveness the gum is used by the Moors as a depilatory. The seed when heated over a fire until it becomes glutinous is used as an application in skin diseases. Very little ammoniacum is sent to Europe. It is chiefly shipped from Mazagan to Gibraltar for reshipment to Alexandria ; a little is sent from Mogador, and none from the other ports. . . . The

* Hanbury, Science Papers, l.c.p. 377.
† Bentley & Trimen, Med. Plants, 1880, sub no. 129.
‡ Hooker & Ball, Marocco and the Great Atlas, 1878, p. 386.

Arabian physician Serapion, writing at the commencement of the ninth century, mentions two kinds of ammoniacum, the best sort of which was produced from the root of a plant found in Crete, and an inferior kind of which he says : ' Sed illud quid continet terram et lapides, nominat chironia et defertur a terrâ quae dicitur Monacon et est succus plantae, simili plantae galbani in similitudine suâ et nascit ibi.' This description agrees with the present Marocco product, and Monacon may be an early name for that country. It is observable that Serapion calls ammoniacum ' raxach.'* . . ." That Leared had in view the same plant as Jackson is evident from the specimen which, in 1875 (?), he communicated to D. Hanbury, and which is still preserved in the herbarium of the Pharmaceutical Society. It consists of a leaf, and may be the very one mentioned by Leared as having been with the root which Signor R. Elmaleh acquired. On the other hand it is quite true that otherwise the *Ferula* has never been recorded from or collected in the district Woled Bu Sba, which is traversed by the much frequented road from Mogador to Morocco City (Marakesh).

In 1884 another attempt was made to introduce the plant into Kew, Mr. Horace P. White having kindly sent rootstocks of the plant obtained from near Rabat. They were placed in the succulent house, but seem to have soon been lost sight of. Later in the same year Mr. White communicated a dried specimen with mature fruits also from Rabat, but they do not seem to have germinated. Mr. George P. Hunot, British Vice-Consul at Saffi, was, however, more fortunate, for he succeeded at last in sending rootstocks to Kew which were vigorous enough to strike. They arrived in January, 1886, and year after year threw up fine tufts of leaves, until in December, 1892, one of the plants flowered. It had stood outside in the sun for a few weeks in the summer, and it is this plant which forms the subject of plate 8157 of the *Botanical Magazine*. It will be useful to add here some passages from Mr. Hunot's letters to Sir W. T. Thiselton-Dyer, referring to the plant under consideration.—Letter dated Saffi, October 30, 1885 : " On my return, however, I sent a Jew to the district where the gum is produced, and he has brought me two roots which I am forwarding by steamer for you. If this is the right kind, then you may be sure that large quantities of gum could be produced, as the tree grows in many places. I have lots on my own grounds that come up annually and produce large stems ; in the hot season you can distinguish gum on the stems when they begin to dry. But the gum is secured by the Arabs by digging around the roots of the trees in the hot season, and piercing them, when the gum oozes out of the trees near or where the incision is made." Letter dated April 1, 1886 (referring to a sample of gum, bought at the City of Morocco) : " You will see that the Arabs take no care in gathering it. They make an incision in the root, which they previously uncover, and in the great heat the gum oozes out, but gets mixed with dirt, as

* Leared's quotation from Serapion is not quite correct. I am not aware that he mentions Crete as the country whence the best ammoniacum comes, and as to Monacon, this is no doubt a corruption of Ammoniacum. I shall have to revert to Serapion's account in another place.

generally during hot weather there is a strong wind blowing. You will find it therefore mixed with dirt, but that is the state of the gum as a rule when sold." On January 6, 1887, he once more reverts to the subject: "The Fassook in this country commences to grow and push forward leaves in the latter part of November or early in December, and dies apparently in the latter end of August, leaving the canes of 7–8 feet in height dry with seed on them. In December again the same root pushes out leaves and commences to blossom about April."

To summarise briefly the information brought together in the preceding paragraphs, it is evident that a *Ferula* occurs in Western Morocco from the Wad el Kos, the river of El Araiche, to the Wad Ummer Rebia, and possibly still farther south. From this plant, when mature, a gum resin, known as gum ammoniac of Morocco, is obtained, which exudes either from the wounds caused by the boring of certain insects or by the tapping of the collectors. The resin is used in Morocco both medicinally and for fumigations, and is also exported to Egypt and Arabia, mainly from Mazagan. The vernacular names are given as Fashook (also spelt Feshook, Fasshook, Fasook), El clagh, Kelth, and Kilch.

Early History of the Gum Ammoniac of Morocco.

The vernacular names quoted in the preceding paragraph may be reduced to two, namely :—Fashook and K'lakh. The other ways of spelling are either due to dialectal variations or to different and no doubt in some cases faulty transliteration. From a note on Mr. White's letter of June 3, 1885, we learn that Fashook is really the name of the gum, while the plant itself is called K'lakh. Now, in the work of Ebn Baitar*, a Spanish Moor who wrote in the thirteenth century, the following information is given under Kalh; "Kalh-*Ferula communis*. This plant is called El-Kinnat by the peoples of Andalusia, which name I have already mentioned under the letter Kaf. With the Egyptians this word designates gum ammoniac, with which I have dealt under letter A under the word Oschak." El Kinnat is evidently the Kana, of which Ebn Baitar says†: "Kana-*Ferula communis*. This plant is known by the name El Kalch in *Western Afrika*, and the Greeks call it Nardex." Of Oshak, however, he says‡: "Oschak-Gummi Ammoniacum. This gum is also called Oschadsch and Woschak§ and Lizak el dsalab, Chrysocolla." There is no doubt that the K'lakh (c'lagh, Kilch, Kelth) of the Moors of to-day is identical with the Kalh (Kalch) of Ebn Baitar, just as the modern Fashook corresponds to his Woshack (Washack, Oschak). Thus it is evident that the gum ammoniac plant of Morocco and its gum resin were known in Morocco at least six hundred years ago under the names which they still bear. The name Kana is preserved in the Spanish Canaheijo (giant cana), the common modern name for *Ferula communis*. Ebn Baitar does not say explicitly that the Egyptians of his day

* Ebn Baithar, Grosse Zusammenstellung der Heil-und Nahrungsmittel. Übersetzt bei J. V. Sontheimer, ii., p. 388.

† Ebn Baithar, l.c. ii., p. 326.

‡ Ebn Baithar, l.c. i., p. 48.

§ In the index Waschak stands for Woschak.

imported the gum from Morocco or "Western" Africa, but he was evidently convinced that their Kalch and Oschak was identical with the El Kalch and Cana of West Africa, which must have been familiar to him. As *Ferula communis* does not occur in Egypt and no form of it is known to produce gum resin in quantity nearer than Morocco and the adjacent districts of South-Western Algeria, the inference is suggested that a trade in Fashook gum from Morocco to Egypt existed in the middle ages. This is the more probable when it is remembered how close were the relations between North-Western Africa and the eastern centres of Islam after the conquest of Mauretania by the Arabs.

But it does not necessarily follow that all the Oshak which reached Egypt and, through Egypt, Europe, came from Morocco, nor that the terms Oshak and Kalch applied originally to the Morocco article. It has indeed been suggested that the African ammoniacum first mentioned by Dioscorides was very early supplanted by the Persian ammoniacum, the resin of *Dorema ammoniacum*, and that the Arab translators and commentators of Dioscorides, being partly Persians themselves, erroneously extended the Persian vernacular Ushaq to the African ammoniacum, including that of Dioscorides. This leads to the question as to what was the ammoniacum of Dioscorides.

The Ammoniakon of Dioscorides.

This is what Dioscorides says of his Ammoniakon, omitting the purely therapeutical part :—"Ammoniakon [is a herb from which the ammonian incense is gathered ; some call it agasyllon, some criotheon, or heliustrum, and the Romans gutta] : and this is the latex of a Ferula which grows in the Cyrenaica. The whole plant, including the root, is termed agasyllis. To be approved it should be of good colour, free of wood particles and stonelets, resembling tears of incense, pure and dense, free of impurities, smelling somewhat like castoreum and bitter of taste. This kind goes by the name of *thrausma* (fragments, analogous to the 'ammoniacum in lachrymis' or tears of modern pharmacopoeias), whilst the other, which contains particles of soil and stonelets, is called *phyrama* (cake, 'analogous to the ammoniacum in placentis seu massis, or 'lump ammoniacum'). It is produced in Libya in the neighbourhood of the Ammon temple, and is the latex of a tree ferula. It is a mollient, epispastic and calefacient, and a diaphoretic for hard and soft tumours. . . ." The above translation is from Sprengel's edition of Dioscorides, vol. I., p. 439. The paragraph agrees in all essential points with the text in the so-called *Codex Vindobonensis* (C), where it is accompanied by a somewhat crude, but characteristic, figure (tab. 46). This throws much light on the plant which Dioscorides, or at least his interpreters up to the beginning of the 6th century, had in view under the name of ammoniakon. It represents a whole plant with four basal leaves, four short, racemosely arranged flowering branches supported by inflated sheaths and a terminal inflorescence. The leaves are about half as long as the flowering stem, and each possesses three pairs of opposite segments of the first order ; these segments are themselves bipinnati-partite and ovate in outline ; the segments of the last (third) order are laciniate with few very short, divaricate lobes. The large, inflated sheaths or spathes at the base

of the branches bear reduced blades resembling the terminal segment of the ground leaves. Each of the flowering branches has a similar but smaller spathe on the side facing the stem. The compound umbels, evidently in the first stage of flowering, are much contracted and compact, and supported at the base by a few minute subulate or linear leaflets. It is clear that the figure represents a *Ferula*, and also that it cannot be *F. tingitana*, in which the ultimate leaf segments are much broader. Nor can it be the ordinary *Ferula communis*, which has very much longer and finer laciniae. It might represent the variety *brevifolia* of *F. communis* but for the less delicate and less numerous laciniae. *F. tingitana* and *F. communis* have been collected in the Cyrenaica; but there is a third species recorded from the Cyrenaica, namely, *F. marmarica*, Aschers. and Taub., which was discovered by Dr. P. Taubert in 1887, near Bomba, about 160 km. to the east of ancient Cyrene, and also by Dr. G. Schweinfurth at Badia. It is not well known and there are no specimens of it at Kew.

Dr. Schweinfurth was, however, kind enough to send me his material, consisting of leaves and young inflorescences, while Mr. W. Barbey and Mr. G. Beauverd courteously lent me some infructescences, collected by Dr. Taubert and preserved in the Herbarium Boissier. The former was particularly valuable, as it represents the plant in exactly the stage in which the ammoniakon of the *Codex Vindobonensis* is drawn. Holding the Badia plant and the plate in the *Codex* side by side, one is struck at once by their remarkable resemblance, although the leaves, in the picture, come out much less "compound." Indeed, as far as the figures of the *Codex Vindobonensis* go—and many of them, in spite of a certain crudeness, are very true—that of the ammoniakon, if it is intended for *F. marmarica*, may be pronounced as one of the best. There is, moreover, some circumstantial evidence for the theory of the identity of *F. marmarica* and Dioscorides' ammoniakon plant. Taubert†, in his account of an excursion to the western Marmarica, describes the appearance of *F. marmarica* near Bomba and the use to which it is put, in this way: "The most characteristic plant of this stony littoral plain is a *Ferula*, subsequently recognised as a new species (*F. marmarica*, Aschers. & Taub.), of which I had already seen ball-shaped masses rolling before the wind on the sandy shore after the fashion of 'wind-witches.' It was only after prolonged searching that I found a few specimens of it still standing in their places with some dried up leaves and young fruits‡, and, by their habit, reminding me very much of Drias (*Thapsia garganica*). Whence came then the numerous loose specimens, found on the shore, of a plant so rarely met with *in situ?* The mystery was solved when I came across a soldier who was busy collecting a resin which exuded from thick roots cut close to the ground and emitting a strong umbelliferous odour. My suspicion that they belonged to the *Ferula* was confirmed by the man, and I was told that the soldiers of Bomba and the few Bedouins that live there cut the plant—which is said to be more common farther eastward

† Taubert in Bull. Herb. Boissier, v. i., p. 447.
‡ The observation was made on June 4th.

—at the rootstock soon after flowering and cover it in with a sort of roof made of flat stones. Then they return after a while to gather the copiously exuding resin, which is at first of a bright and afterwards of a dirty yellow. It burns readily, leaving behind a not unpleasant smell; it serves for lighting fires and, made into candles, as a very poor illuminant. It is also a reputed medicine, but unfortunately I was unable to learn of its application. . . . Under the name of '*fassúch*' it is an article of trade and is sent far, as, for instance, to Derna." The eastward distribution of the plant is confirmed by Dr. Schweinfurth's discovery of the plant at Badia, about 100 km. east of Bomba, where it was just beginning to flower on the 10th of March,* and was known by the Arabic name of Kalch. In connection with Taubert's account of the tapping of the root, I would refer in this place to a passage in Serapion's paragraph on ammoniakon,† where he says "on the authority of Dioscorides" :—" Hec herba grece dicitur asios *cuius radix vulneratur egreditur lachrymus qui colligitur et servatur*." The gum obtained in the manner described by Taubert would no doubt be of the "phyrama" kind (ammoniacum in placentis). It is apparently at present quite unknown in Europe and has, of course, never been analysed. There were, however, a few small drops of resin on the dry infructescences in the Herbarium Boissier such as would be classed as 'thrausma' (ammoniacum in lachrymis). They were of a deep yellow colour resembling amber. I tasted one half of one of them and burnt the other. The taste was moderately bitter without any subsequent addition of acridity, whilst the odour was decidedly stronger and pleasanter than that of burning Morocco Fashook.

Thus we still have in the Cyrenaica, the home of the Ammoniakon of Dioscorides, a *Ferula* very much resembling, if not identical with, Dioscorides' plant and producing a gum resin of the same kind as that described by him. The plant and its product go by the same name as the Morocco *Ferula* and its gum resin, Kalch and Fashook. There is, therefore, no reason to doubt the correctness of Dioscorides' account. The destructive method of tapping may have contributed much to the reduction of the area of his ammoniakon. It has, for instance, not been observed by recent explorers in the neighbourhood of the site of the old Ammon temple, where, almost more than anywhere else, it must have been exposed to the danger of extirpation by the gum collector. At the time when Ebn Baitar wrote, the Cyrenaica formed part of the Egyptian Ayyubi caliphate, and the "Egyptians" of whom he says that they designate gum ammoniac by the name Kalch which is also Ushaq, no doubt meant rather the Cyrenaican than the Moroccan gum although it is, of course, quite possible that they also received a certain quantity of the latter without distinguishing clearly between them. It appears therefore that the terms Kalch and Ushaq (Fashook) became *nomina generica* at a very early date, just as the name gum ammoniacum is used at the present day for at least three distinct umbelliferous gum resins.

---

* Schweinfurth and Ascherson, Primitiae Florae Marmaricae, in Bull. Herb. Boiss. vol. I. pp. 442, 649.

† Ortus Sanitatis, Matthaei Silvatici (1511), cap. xlv., and Liber Serapionis Agregatus, transl. Symon and Januensis (1473), cap. 254 (in contracted Latin).

Origin of the vernacular Names.

If the names Kalch and Ushaq (Fashook) were *nomina generica* as early as the beginning of the 13th century, where did they originate and what was their original meaning? To answer this question the assistance of the linguist has, of course, to be called in, but up to a certain point the botanist is able to prepare the way. We find the name Kalch—i.e., the name of the plant already mentioned in Ebn al Awwâm's 'Book of Agriculture'*—(10th to 12th century) and in Assaf's (the Jew's) list† of medicines (10th or 11th century). In the latter it occurs as an Aramaic name and synonym of Ammoniakon. As the Aramaic language was already dying out at the time when Assaf wrote, we may assume that its origin lies much further back. Löw interpretes Kalch as 'cava arundo,' so that its application to ammoniacum-yielding Ferulas is a parallel to that of Kana (canna arundo), both being descriptive of the full-grown stems of those Ferulas. The term Kalch takes us back therefore to one of the oldest members of the Semitic languages, and there can be little doubt that it was in use for the Cyrenaic ammoniacum plant long before it found its way into Morocco with the Arab conquerors. With the tenacity which characterises vernaculars connected with oriental folklore it has survived not only in Morocco and the Cyrenaica, but also further east on the frontier of Egypt and Syria where Ascherson found this name applied to a third species of *Ferula*, possibly *F. sinaitica*. As to Fashook, I have already stated that it is evidently only a slight variation of the Arabic Ushuq or Ushaq which appears as Woshak and Washak with early writers. The first authors to mention it are probably Honain Ben Isaháq (9th century) and Mazargawaih or Mohammed Ben Zakaria (9th to 10th century), both quoted by Ebn Baitar.‡ Then we find it in the 10th century with Mowafik§ in his *Liber Fundamentorum* (about 975), and after that with practically all the Arabic writers. Through Serapion the younger, a contemporary of Ebn Baitar, (13th century) it found its way into the books of the school of Salerno‖ and into Matthioli's commentary of Dioscorides. In the former it occurs as "vasac" or "fasaac (fasac)" and in the latter as "raxach seu assach" or "assac"; "raxach" being obviously a misreading for "vaxach." I cannot venture to discuss the etymology of Ushaq and its variations; but I may perhaps be permitted to call attention to the following fact. Dioscorides calls the plant, according to the *Codex Vindobonensis* (C) and the usual editions of his *Materia Medica*, Agasyllon or Agasyllis, a name which has, so far as I know, not been explained, nor can it be connected with one of the vernaculars which subsequently came into use. Serapion, however, who most probably knew another version

---

* *See* Löw, Aram. Pflanzennamen, p. 340.

† *See* Löw, l.c. p. 25, 340.

‡ Ebn Baithar, l c.

§ Mowafik, Liber Fundamentorum, Ed. Seligmann, p. 35; ed. Achundow, p. 154.

‖ e.g. Ortus Sanitatis, ed. Mentz, 1485, cap. xliii; ed. Jac. Meydenbach, Moguntiae, 1491, cap. xlv; ed. Matthaei Silvatici, 1511, cap. xlv.

¶ Matthioli, Comment. Dioscor., ed. 1565, p. 803.

of Dioscorides' work, says, as already quoted (p. 383) "auctoritate Dioscoridis" :—"hec herba grece dicitur *asios* . . ." Cannot the grecianised Asios and the Arabic Assac or Assach (Ushaq) have the same derivation from some libyan or old semitic vernacular, then in use in the home of the Cyrenaic ammoniacum plant?

It is frequently stated that Ushaq was originally the Persian name for the gum resin of *Dorema ammoniacum*, and erroneously transferred to the Ammoniakon of Dioscorides by the early Arabic writers, some of whom were Persians. Dymock * especially assumed that Mowafik (about 975 A.D.) in his paragraph on Ushaq meant the Persian and not the African drug. It is true that Seligmann in his translation of Mowafik's *Liber Fundamentorum* (p. 35) quotes under gummi ammoniacum : "Nota marg. Wesche, persice idem"; but Achundow has it not. It may be a later addition and mean no more than that the Persians call Dioscorides' gum ammoniac Wesche. There is otherwise nothing in Mowafik's paragraph which would suggest that he meant by Ushaq the Persian gum ammoniac. On the contrary, he adds "vocatur a Graecis afarikun" (African), which remark would certainly have challenged an explanation if he had had the Persian article in his mind. Nor is there in the later Arab writers any definite reference to a *Persian* Ushaq, and it appears to me more probable that the Persian Pharmacopoeias transferred the name Ushaq from the Arab literature to their own ammoniacum plant, the *Dorema ammoniacum*. The Ulfaz Udwiyeh of Mohammed el Shirazi (about 1450) has (no. 160) actually Ushuck as an Arabic name, whilst the Persian equivalent is given as 'Se-mugh te-rá-tees' and 'Se-mugh bil she-reen.' It is true, the same book mentions later on (no. 1134) derukht ushuk as the Persian name of the tree which produces the gum ammoniac, but this means simply Ushuk tree, 'derukht' (daracht) being Persian for tree.

Export.

The Ammoniakon of Dioscorides, Plinius and the later writers up to the conquest of the Cyrenaica by the Arabs, came no doubt from the ports of the Cyrenaica such as Darnis (Derna), Platea (an island in the Gulf of Bomba), &c., and from Alexandria, the great trade emporium of the Levant. The export to Europe continued, though much reduced, after the advent of the Arabs and their subsequent supercession by the Turks; for the drug was always more or less in demand for medicinal purposes. But apart from an occasional reference to Alexandria†, as the port from which it was shipped, and repetitions of Dioscorides' statement that it was gathered in the Cyrenaica, nothing more definite can be learned from mediæval and renaissance writers. Even Pomet in his '*Histoire des Drogues*' (1694), and Tournefort in his '*Materia Medica*' (1708), and Lemery in the '*Dictionnaire des Drogues*' (1698), fail to advance our knowledge on that point, and Linnæus himself in '*Materia Medica*' (1749), p. 182, still quotes

* Dymock, Warden and Hooper, Pharmacograph. Ind, vol. ii, p. 157.

† Matthioli, Comm. Diosc. ed. 1584, p. 379, says, "Very little comes to us from Alexandria in tear shape. Mostly it is impure, like pitch, and in compact masses."

"Lybia, Barca, Aegyptus occidentalis," as the country of origin for gummi ammoniacum. Nowhere can I discover the slightest reference to Morocco as another source of the drug, although it is very probable that when once the Morocco Fashook reached Alexandria it got mixed up with the Cyrenaica resin and followed the same trade channels. One thing is certain, however, that the drug, from wherever it may have come, was nearly always the coarser kind, the ammoniacum in lumps, with plenty of impurities.* Meanwhile the Persian drug, the gum resin of *Dorema ammoniacum*, crept in as a substitute for the African article unnoticed by the European pharmacists. Valentini (1732)† appears to have been the first to record it, although he himself was not aware of its distinctness from the ammoniacum of Dioscorides; but his words, "magnis frustris multa alba grana includentibus ex India Orientali in Europam fertur," leave no doubt that it was the *Dorema* resin to which he was referring. This came by way of Bombay and Alexandria, but part of it may have also come overland, as is suggested by a passage in Murray's *Apparatus Medicamentorum* (1792), vol. vi., p. 190: "Per Turciam ad nos transfertur, item ex India orientali," although the gum received "per Turciam" may have been in part Cyrenaica or Morocco gum. It was only then that attention was concentrated on the Persian article, with the result that its source was at length discovered in *Dorema ammoniacum*, and it has practically crowded out the African product from the European market.

The Morocco Fashook was first noticed, as already stated, by J. G. Jackson in the early years of the last century. Attempts to secure a place for it in Europe have been made repeatedly but with little success, owing, no doubt, to the extremely crude method of preparation. Considerable quantities of it were exhibited at the Vienna international exhibition of 1873. Vogel‡ described them as cakes, several kilograms in weight, made up of a dark brown mass consisting of lumps of resin, of the size of a walnut or less, soil, sand and fragments of the plant. The principal shipping port for Morocco gum ammoniac is Mazagan, whence it goes mostly via Gibraltar to Alexandria. Small quantities are also exported from Mogador.

Chemistry.

I have already observed that the chemistry of the gum ammoniac of the Cyrenaica is absolutely unknown. The Morocco gum has been examined repeatedly, but its exact constitution is still uncertain. By treating it with molten potash, G. Goldschmidt§ obtained resorcin and a crystallised substance of the formula $C_9H_8O_5$ which melts at 265°, and its aqueous solution turns a beautiful red on the addition of chloride of iron. Hirschsohn‖ found umbelliferon in it, whence Tschirch is inclined to place it next to Galbanum. The taste of the Moroccan

* *See* footnote on p. 385.

† Valentini, Hist. Simpl., p. 279.

‡ *See* Wiesner, Rohstoffe d. Pflanzenraichs, 2nd ed., v. i., p. 201.

§ *See* Wiesner, l.c. v. i., p. 205, and Tschirch, Die Harze und Harzebehälter, 2nd ed., p. 339.

‖ *See* Tschirch, l.c. p. 340.

gum ammoniac is less bitter and much less acrid than that of the Persian, and the odour of the burning gum resin is more pleasant. If alcoholic ammonia is poured over the former a bluish fluorescent liquid is obtained, which is not the case with *Dorema* gum. On the other hand, the colour of the Moroccan ammoniacum remains unaffected by a solution of chloride of lime, whilst the Persian gum assumes an orange colour.

Botany.

In the text accompanying plate 8157 of the *Botanical Magazine*, I have given a succinct account of the taxonomic position of the plant yielding the gum ammoniac of Morocco. To conclude the present article, it will be useful to repeat, and slightly extend, what has been said there. The earlier identifications with *Ferula orientalis* and *F. tingitana* may be dismissed without further comment (*see* p. 377). It is quite certain that the plant belongs to *Ferula communis*, L. (sensu lat.), and the only question to discuss is the place and name which it should be given within this taxonomic unit.

Ferula communis has a wide range in the Mediterranean countries, from the Canaries and Portugal to Constantinople, Asia Minor and Syria, but with the exclusion of Egypt. It is subject to a certain amount of variation, particularly in the length and width of the ultimate segments of the leaves, the size and also, within narrow limits, the shape of the fruits and the number of intravallecular vittae. It is the leaves which interest us most in this place. In typical *Ferula communis*, as it first became known and as it occurs commonly in Southern Europe, the ultimate leaf segments are generally over 2 cm., and frequently over 3 (up to 5) cm. long, with a width of 1 mm. or less. Occasionally, however, individuals occur with much shorter segments, that is, of less than 1 (to 0·5) cm. in length, and 0·5–1 mm. in width. Such specimens were described in 1820 from Portugal as *Ferula brevifolia* by Link in Roemer and Schultes' *Systema* (vol. VI., p. 592), and in Hoffmansegg and Link, *Flore Portugaise* (vol. II., p. 416, tab. 108); then, in 1842, from Sicily, as *Ferula nodiflora*, by Gussone in his *Flora Sicula* (vol. I., p. 353); in 1846, from the Canaries as *Ferula Linckii* by Webb and Berthelot in their *Isles Canaries* (*Phytographie*, vol. III., p. 160, tab. 75); and in 1848, from Southern France, as *Ferula nodiflora* var. *monspeliensis* by Grenier and Godron in their *Flore Française* (vol. I., p. 692). It appears under still another name in Buch *Beschreibung der Kanarischen Inseln* (1825), where Link enumerates it (p. 132) as *Ferula aurea*, adding as synonym *Peucedanum aureum* (auctorum),* under which name it had been figured a few years previously (1821) in the *Botanical Register*, tab. 559, from a specimen introduced into Lambert's garden at Boyton in 1790. No other character, except the less saturated green of the foliage, is adduced by the authors mentioned to separate the plant with the short leaf-segments from *Ferula communis*, and the more modern floras enumerate the form with the short segments as a variety of *Ferula communis*. I have, indeed, in the Botanic

* *Sic*, he does not give Solander as the authority.

Gardens at Kew, repeatedly seen leaves representing the common and the *Linkii* type of leaf in the same individual, and I was inclined to drop the distinction of the short-segmented form, even as a variety, if it had not been for the fact that the *Linkii* type is the only form of *Ferula communis* which I have so far seen from Morocco, although specimens from Morocco, under cultivation, sometimes show an approach to the typical form, as may be seen from the *Botanical Magazine* figure. It may be that in Morocco the *Linkii* type has become more fixed and has grown into a distinct race, characterised at the same time by a more abundant production of gum resin. Battandier and Trabut record from the south-western part of Algeria a variety of *Ferula communis* which they characterise merely by stating that "it exudes from the stems, and often also from the tips of the leaf-segments, a copious gum analogous to gum ammoniac, and possibly identical with the Fushog of the Moors." I have seen no specimens of this plant which they mark simply as "*β gummifera*," and have for the present preferred to accept Mariz's name for the variety, namely, *brevifolia*. As to the plant that produces the Cyrenaica gum ammoniac, I would refer to what I have said concerning its appearance in the paragraph on the Ammoniakon of Dioscorides, for it is obviously a quite distinct species.

LIX.—VISIT TO NEWPORT AND SOUTH WALES.

W. Dallimore.

The contribution of an exhibit to the forestry section of the "Bath, West of England, and Southern Counties Agricultural Societies' Show" by the Director of the Royal Botanic Gardens, Kew, furnished the object for my visit to Newport in June. After the necessary work attached to this exhibit was accomplished, I was able to go and see several gardens of interest during the show week, and the appended notes are the outcome of my journeyings.

Forestry Exhibition.—Although it is only the second year that the subject of forestry has formed one of the distinct features of the "Bath and West" show, it has excited a considerable amount of interest among landed proprietors, and a great many exhibits were got together on this occasion. These exhibits were of both educational and commercial value. On the one hand, the effects of culture on various trees were well shown—such as good and bad planting, pruning, the rate of growth of various timber trees on different kinds of land and at varying altitudes, &c., and the effect and treatment of insect and fungus pests. On the other hand, planks of home-grown timber, with the approximate ages of the trees, were shown; samples of various woods in the rough, planed, and polished; gates, window frames, doors, fencing suitable for farm work, all from home-grown timber, with details of cost. Then again timber showing the advantages accruing from treating with creosote previous to use, and various other items. During the exhibition lectures and demonstrations were given on various operations connected with forestry.

The Hendre.—On the outskirts of Monmouth, about two miles from the centre of the town, an entrance is gained to the park which

surrounds the mansion and gardens of Lord Llangattock. Through this park the carriage drive winds for a distance of two miles in the midst of delightfully picturesque country, until suddenly, on turning a bend, the mansion and gardens are seen nestling in a valley from which on all hands the ground rises, sometimes sharply, at others gradually, until it passes into mountainous ranges in the far distance. Throughout the whole of this two miles one's attention is continually claimed by some fresh object; in one place a group of Conifers with Douglas firs, and a fine example of *Abies nobilis* var. *glauca*, in another venerable old yews, extensive open glades sacred to deer and rabbits, with fine views over the surrounding country.

The natural timber about the park is principally oak, some of the trees being of great age and large dimensions. The tree of largest girth which I measured was 28½ feet in circumference at 3 feet above the ground. Within a short distance of this some yews were growing, not remarkable for height but of great girth. One, measured at three feet from the ground, was 18½ feet in circumference. In the garden the most striking trees were *Tilia petiolaris*, *Tilia platyphyllos* var. *asplenifolia*, 35 feet high; *Acer Pseudoplatanus* var. *foliis albo-variegatis*, 40 feet high; *Sequoia sempervirens*, 90 feet high, with a girth of 12 feet; *Pinus excelsa*, 90 feet high, and *Abies Nordmanniana*, 95 feet high and 9 feet 5 inches in girth. Scattered about the formal part of the garden are a number of golden yews cut into various fantastic shapes, and these at the time of my visit were very highly coloured. The Hendre has long been famous for its fruit, and at the time of my visit numerous houses were filled with exceptionally well-grown grapes, peaches, pines, &c.

Returning from Monmouth to Newport the journey can be made by the Wye valley route, by which the best of the famous Wye valley scenery can be seen, as the railway runs parallel with the river for a considerable distance.

CARDIFF CASTLE, which is the South Wales residence of the Marquis of Bute, is situated in the city within five minutes walk of the Great Western railway station. To the antiquary and historian it is of deep interest, for it formed one of the Roman strongholds, and portions of old Roman walls still exist. The castle was originally surrounded by high battlemented walls and a moat, both of which were partially ruined by Cromwell. Within recent years the moat has been cleared, and considerable portions of the walls have been rebuilt on the old foundations in accordance as nearly as possible with the original design. At a later date the estate was held by a religious body, and in two places dwarf walls have been built on the original foundations to mark out the positions of the chapel and various offices pertaining to the abbey. At the present time the gardens are in a transitional condition, for the old kitchen garden is required for building purposes and a new one with modern glasshouses is being formed over half a mile away. The pleasure grounds are of considerable extent, and consist of fine sweeps of lawn with groups and plantations of trees. The vineyards for which Cardiff Castle has so long been famous are situated several miles away, but as my time was limited I was unable to pay them a visit.

ST. FAGANS.—The castle of St. Fagans, the Welsh home of the Earl of Plymouth, crowns the summit of a low hill within a few minutes walk of St. Fagans station. It is of ancient origin and its strong, encircling walls—of which a considerable portion are still intact—afford evidence of its importance in the war-like times of the past.

Signs of the gardener's art are most conspicuous in the immediate neighbourhood of the castle, where a plateau enclosed by the old walls is divided up into a series of small gardens, each of which is devoted to some special feature. Thus, there is the Dutch garden with a central lawn on which flower beds have been arranged with a lavish hand, interspersed with formal and fantastically clipped golden yews. The beds at the time of my visit were filled with bedding plants conspicuous for bright coloured foliage and flowers, which in conjunction with the green turf and the young shoots and foliage of the yews proved most effective.

From this garden access is gained to the mulberry garden, famous for its venerable mulberry trees, which are remarkable on account of their low, horizontal branches, which grow out to a considerable distance from the centre of each tree. They are undoubtedly of great age, and their general appearance suggests that these horizontal branches are due to an attempt on the part of the trees to recover from some disaster which has occurred to the main trunks in times long past. Although central trunks are now absent, the manner of branching and the general aspect of the whole suggests that they must have been normal specimens at some previous period of their history.

A rose garden, planted with numerous varieties of the best types of garden roses, forms a pleasant feature. The annual garden is of more than passing interest; this is apart from the other gardens and contains a number of old fruit trees, the ground below being entirely carpeted with groups of the most ornamental, hardy, and half-hardy annuals.

Then there is a paved garden, which is peculiar by reason of its numerous miniature beds intersected by narrow ornamentally paved paths. The beds are filled with dwarf, old-fashioned, herbaceous perennials, and the old place recalls descriptions of gardens such as delighted our forefathers of a couple of centuries ago. An instance of old-fashioned, ornamental paving is noticeable in a small courtyard near the annual garden. In this the pavement is of flat stones of irregular size and shape, fitted together with the greatest exactitude, the whole forming an interesting feature.

A distinctly harmonious note is struck by the manner in which the old walls are utilised as a wall garden. Although some assistance has probably been given by man, the hand of nature has been busy, and every crack and crevice has its occupant, Red Valerian, many species of fern, ivy-leaved Toad-flax, and hosts of other plants growing together in riotous profusion.

From the castle the ground falls rapidly by terraces to a series of formal lakes with well-wooded pleasure grounds beyond.

MARGAM PARK.—On alighting from the train at Port Talbot, a good four miles have to be traversed before the grounds

surrounding the mansion are reached, although for the greater portion of the route the public road bisects the Margam estate. The demesne, the property of Miss Talbot, is one of the noblest in South Wales and extends over an area of 20,000 acres. It presents a beautiful panorama of richly wooded hills, grassy mountain sides, fertile valleys, and fair homesteads, with here and there glimpses of wind-blown sand dunes. Below ground the estate is also of great value, for it is rich in coal.

Like many another stately British home, Margam has passed through various vicissitudes. At one period it occupied some importance in the ecclesiastical world, and the ruins of a large abbey, which dates back to the eleventh century, still exist. Near these ruins stands the mansion, a fine stone structure, crowning the summit of a small hill, and placed at the end of a long vista. In its vicinity are extensive lawns merging into well wooded park land, which gradually passes over to the distant series of hills and valleys thickly clothed with trees.

Throughout the gardens a number of fine specimens of native and exotic trees are to be met with, among them the sweet bay, *Laurus nobilis*, many specimens of which are remarkable both for height and spread of branches. Other noticeable trees are *Sequoia gigantea*, with a girth near the ground of 21 feet 11 inches; *Acer palmatum*, a well furnished tree 20 feet high; *Liriodendron tulipifera*, 96 feet high, with a girth of 13 feet 8 inches at 3 feet from the ground; *Aesculus Hippocastanum*, with a girth of 17 feet 10 inches; *Fagus sylvatica*, var. *heterophylla*, 40 feet high and 8 feet in girth, with a head diameter of 69 feet; *Abies cephalonica*, 12 feet 7 inches in girth; *Pinus pinea*, 7 feet 7 inches, and *Cryptomeria japonica*, 8 feet 3 inches in girth. *Pinus muricata* is represented by a fine example upwards of 60 feet in height, with a girth of 10 feet 8 inches at 3 feet above the ground. Amongst shrubs, *Olearia macrodonta* was in very fine condition at the time of my visit, one specimen 10 feet high and as far across being specially noteworthy.

Margam Park has long been celebrated for its orange trees, which looked remarkably well. About 50 specimens are grown in tubs, and during the summer they are placed on a lawn in the pleasure grounds, winter accommodation being provided in a spacious orangery 100 yards long. Although Margam can boast so many fine orange trees, little account is taken of them in comparison with two decrepit specimens that stand alone. These, I was informed, have been on the estate for about three centuries, and are supposed to be the first two plants introduced to the British Isles. They were sent from the Continent as a present to the then reigning monarch, but the vessel which carried them was wrecked, and the plants were washed ashore at Port Talbot, whence they were conveyed to Margam, and here the king directed them to be retained.

The orangery is similar in appearance to the majority of old orangeries seen in gardens. It contains, however, two interesting statues, one of the Emperor Servius, and the other of Hercules. Both are very ancient work, and the latter is said by antiquarians to belong to a period anterior to the advent of Christ.

The Margam estate is naturally well wooded, and of late years all the woods have been placed under the charge of a trained forester, who is proceeding with their development on the most approved lines. In the nursery quarters there were hundreds of thousands of larch, Scots pine, Douglas fir, and Norway spruce in various stages of development, and from these extensive plantations are made annually. Larch is grown more largely than any other tree, and it is singularly free from disease. The common larch is most frequently met with, but *Larix leptolepis* is also grown, and where the two are planted side by side the latter has quite outgrown the former. At present, however, the Japanese species is said to be too dear for profitable planting.

The work of the estate is carried out by about 300 men of various trades and occupations. The works yard contains shops for various tradesmen, such as carpenters, masons, painters, &c., and ample machinery is provided for sawing, planing, moulding, and various other kinds of work, the motive power being obtained from a water-driven turbine engine. As far as possible home grown timber is used for estate purposes, and wherever possible it is creosoted. The creosoting plant is a lesson in economy, the whole having been erected at a cost of £75. It consists of a large cylindrical boiler, such as was formerly used in collieries, placed horizontally above a furnace and open at the top like a trough. By its side is a large creosote tank with a pump connected with the boiler. The wood, such as gates, doors, window-frames, posts, and rails, or anything else that requires treatment, is placed in the boiler, and sufficient creosote is pumped in to cover the whole, and then the fire is lighted. The creosote is brought to about the boiling point of water, and is kept at this temperature for two days ; the liquid is then drawn off and the pickling is completed. Heated creosote is stated to be more efficacious than cold, especially when green wood is employed. To illustrate the value of creosoted timber over that which has not been so treated, some posts of birch, poplar, and beech were pointed out to me which had been in the ground for three years and were perfectly sound, whereas it rarely happens that unpickled wood of these trees, of similar dimensions, lasts for more than one year.

Statistics are preserved of the actual cost of material and labour for various kinds of work, and I was shown 5-barred farm gates 9 feet long and 4 feet high—specially braced and strengthened with iron clasps—made of larch rails and oak ends, the total cost of which, including hinges, fastenings and creosoting, was 17*s.* 6*d.*, or with a pair of strong oak posts 12*s.* extra.

An interesting fact was brought to my notice in the case of a large plantation of young larch that had been accidentally burnt. A portion of the land had originally been covered with bracken and the remainder with gorse. The year after the fire 50 per cent. of those trees planted amongst bracken sent out strong shoots from the ground line, whilst only 5 per cent. of those planted amongst the gorse grew again.

Experiments with Marram grass (*Ammophila arenaria*) are in progress near the shore in the neighbourhood of Port Talbot for the reclaiming of the sand dunes, and £30 a year is spent on this work. The results so far are said to be satisfactory.

Singleton Abbey.—This, the demesne of Lord Swansea, is situated on the outskirts of Swansea and about two miles from the centre of the town. Like most of the South Wales estates it has great natural beauty, the grounds being undulating and well timbered, with here and there considerable open spaces of park-land dotted with fine specimen trees. The Abbey occupies a good position on rising ground and from it vistas have been opened up which carry the eye either to distant views of tree-clad hills or to the bay with the open sea on the horizon.

Of the many interesting subjects to be seen at Singleton the most important are the conifers and rhododendrons. A former proprietor about 70 years ago formed an extensive pinetum, planting in it every hardy conifer that he could then obtain ; this has been added to from time to time since, so that it now contains a very large number of species. Amongst a few of the specimens noted were *Picea Menziesii*, 90 to 100 feet high, *Cryptomeria japonica*, 60 feet high with a trunk diameter of 18 inches, *Pinus excelsa*, 90 feet high and 9 feet in girth at 3 feet above the ground, *Tsuga Mertensiana*, 100 feet high with a girth of 7 feet 7 inches, *Araucaria imbricata*, 70 feet high with a girth of 6 feet 6 inches, *Sequoia sempervirens*, *Picea Morinda*, *Abies cephalonica*, *A. grandis*, a form of *Araucaria excelsa* with very small leaves and slender branches, and *Podocarpus macrophyllus*, 25 feet high, forming a perfect specimen from base to summit.

Himalayan rhododendrons are represented by many large examples, the finest of which are *R. Thomsoni*, 20 feet high with four main branches, *R. barbatum*, 33 feet high, with a magnificent head on a trunk 12 feet high, *R. Hodgsoni*, 12 feet high and very bushy, and *R. Falconeri*, 30 feet high with a head 18 feet through and a trunk girth of 35 inches. The last-mentioned plant is claimed to have been raised from the first batch of seeds received in this country. The seeds, I was informed, were sent to Edinburgh by Colonel Sykes, who commanded the first expedition in the Himalayas, and a portion of the consignment was sent from Edinburgh to Singleton. Hybrid rhododendrons, both evergreen and deciduous, are grown in large quantities, and many have attained large dimensions.

A few other interesting specimens which deserve mention are *Fagus sylvatica*, var. *laciniata*, 60 feet high with a trunk girth of 7 feet at 3 feet from the ground and a head diameter of 54 feet ; *Prunus serrulata*, with a trunk 5 feet 6 inches in girth and a head 40 feet through ; a magnificent specimen of *Fagus sylvatica*, var. *pendula*, 60 to 70 feet high and of perfect outline ; many very fine examples of *Arbutus Unedo*, *Quercus coccifera*, and *Grevillea rosmarinifolia*.

Clyne Castle is situated midway between Swansea and The Mumbles, and is the residence of W. G. Vivian, Esq. It may be reached by means of The Mumbles railway, Blackpill being the nearest station. As my visit was made during heavy rain I was unable, unfortunately, to make a thorough round of the gardens. Himalayan rhododendrons are grown in quantity, and good examples of *R. Hodgsoni*, *R. barbatum*, *R. grande*, *R. arboreum*, and *R. Falconeri*, *R. camelliaeflorum* and *R. campylocarpum* were

noted. *Embothrium coccineum* was in fine flower, as was also a good example of *Pieris formosa*; *Fabiana imbricata* in the open ground was noticed as a bush 6 feet high; *Abelia uniflora* 7 feet high and as much through; *Eriobotrya japonica* 20 feet high; two forms of *Colletia cruciata* 20 feet high; *Pittosporum Tobira* 12 feet by 12 feet; *Acacia dealbata* 25 feet high, and numerous large, well-flowered clumps of *Libertia formosa*. *Arbutus Unedo* was represented by numerous specimens of great size, as were also several conifers. Mr. Vivian favours a free and natural style of gardening, and under these conditions rambling roses and numerous other climbing shrubs have attained very large proportions.

PENLLERGAER.—Sir J. T. D. Llewelyn, Bart., is well known as an ardent horticulturist; his garden at Penllergaer contains a most interesting collection of plants and is one of the show places of South Wales. Situated about five miles from Swansea, it is rather difficult of access, but the visitor is well repaid for any inconvenience he may experience during the journey by the natural beauty of the country through which he passes. After leaving the public road there is a carriage drive over a mile in length before the garden is reached. This drive has been cut out of the side of a hill, and on the one hand rises well-timbered ground, whilst on the other the land dips rapidly to a well-watered valley with tree clad hills beyond. As an undergrowth to the trees rhododendrons, evergreen and deciduous, have been planted in profusion, and at the time of my visit they were gorgeous with flowers.

Sir John has long been a rhododendron enthusiast, and he has a fine collection of Himalayan species, with a large number of hybrids, many of which are of his own raising. Some of the finest examples noted were *R. arboreum album* 25 feet high, *R. Thomsoni* 15 feet high by 12 feet wide, *R. cinnabarinum* 15 feet high with a bushy head, *R. Hodgsoni* many specimens from 5 to 12 feet high, *R. campylocarpum* 8 feet high, quantities of fine plants of *R. barbatum*, *R. campanulatum*, and *R. lanatum*.

Hardy bamboos are also favourite plants at Penllergaer and many fine clumps of the various species were noticed. Hardy shrubs, especially those belonging to *Ericaceae* are much in evidence, and many fine examples of *Kalmia latifolia*, *K. angustifolia*, *Pieris floribunda*, *P. japonica*, *Pernettya mucronata*, &c., may be seen.

In one part of the garden my attention was directed to an ornamental pool which was formed for the express purpose of growing the *Victoria Regia* out of doors. The water in this pool was heated by hot water pipes, and the plant had been grown and flowered in the position. Its culture is now discontinued, and the principal interest attached to the pool at the time of my visit lay in several colonies of robust plants of *Primula sikkimensis* which grew about the margin.

Amongst conifers the finest specimens I noted were *Tsuga Mertensiana* 95 feet high and 12 feet 9 inches in girth at 1 foot from the ground, *Araucaria imbricata*, and *Cryptomeria japonica*.

The student of entomology visiting Penllergaer will find much to interest him, for, in addition to Sir John being deeply interested in the science, a pensioned gardener of his, Mr. Stafford, who is 85 years of age, has given the whole of his leisure to the subject for the last 60 years. He has got together a remarkable collection of native and exotic butterflies and moths.

ASHTON COURT, situated in the suburbs of Bristol, is of easy access either by tram or omnibus, yet it is quite away from the city and in the midst of rural surroundings. The demesne belongs to Lady Smyth, and covers a very extensive area. The park which immediately surrounds the house and gardens is enclosed by a wall 5 miles in length and extends from the famous suspension bridge at Clifton on the one side to the village of Long Ashton on the other. It is chiefly remarkable for the great number of fine, well-grown timber trees it contains. The prevailing tree is elm, closely followed by oak, with a fair sprinkling of beech. Many examples are in the prime of life, but some are of great age, and one oak, I was informed, is mentioned in the Domesday Book. This particular specimen, though hollow and decayed at one side, girths 21 feet at 3 feet above the ground, and still appears to have many years of life in store. Another oak I measured girthed 28 feet, whilst I found an elm 19 feet 3 inches and a beech 18 feet 9 inches in girth. The latter two trees were remarkable for the height of the bole.

The gardens are exceptionally well kept and contain a good collection of plants. Hardy shrubs and herbaceous plants are being planted extensively, whilst roses are grown in large quantities. On a wall I noticed fine examples of *Bignonia capreolata*, *Clematis montana*, *Fremontia californica*, and other similar plants. Near the flower garden I was shown a perfect specimen of *Buxus balearica* which was 12 feet high and as far through.

PUBLIC PARKS.—The parks of Newport, Cardiff and Swansea were visited. In the former town the principal park is situated within easy distance of the centre of the town and in a favourable position for good gardening. Unfortunately, however, too great a use has been made of laurel and privet in the planting, and, as these shrubs have been hard clipped, the general effect leaves much to be desired.

The chief parks of Cardiff are Roath and Victoria. The former is peculiar by reason of its great length and extreme narrowness, for in no part does it exceed 400 yards in width, whilst much of it is considerably less; yet so well is the narrowness masked by shrubberies, which carry the eye over the boundary fences to the rising ground beyond, that the lack of width is unnoticed. This park is divided by the public streets into several sections, each one of which is given over to a distinct feature. Thus, one portion is used as a botanical garden, and contains good collections of trees, shrubs and herbaceous plants, a rockery, cactus house and student's garden; another is laid out with bowling greens and tennis courts, with attractive surroundings of shrubberies and beds of various showy plants; a third is reserved as a general playground, whilst another contains a lake 30 acres in extent,

sacred to boating and fishing, and still another section is reserved as a wild garden. Provision is made for keeping the lake well stocked with fish by means of hatcheries and nurseries, many thousands of fish being turned out annually. Victoria park is situated on the opposite side of the city, and offers many attractions. In both places specimens of *Paulownia imperialis* were seen in flower.

Swansea is well endowed with parks, although their acreage is not large. These parks are widely spread over the town, and are in most cases of easy access by means of electric trams. Several are delightfully situated and both climate and soil are alike suitable for the successful cultivation of many semi-tender trees and shrubs, such as are cultivated out-of-doors in Devon, Cornwall and other favoured localities. Unfortunately the systematic upkeep of the parks has only been given serious attention for three or four years past and, although much has been done since the appointment of a general superintendent, there will be several years of hard work before they can be expected to do themselves justice. During the last two or three winters a considerable amount of work has been done in the formation of rose gardens, shrubberies, lawns, a rockery, tennis courts, bowling greens, &c. If the present ideas of gradually replacing worn-out specimens of common shrubs with those of a more interesting nature are carried out, together with the formation of a good herbaceous collection, Swansea will have good reason to be proud of her parks in the near future.

LX.—ZAPUPE FIBRE PLANT.

In continuation of the note published in the *Kew Bulletin*, No. 5, 1906, p. 190, the following report by Mr. L. J. Nunn, British Vice-Consul at Vera Cruz, Mexico, which we have received through the courtesy of the Under Secretary of State for the Colonies, is of considerable interest.

It is suggested that Zapupe might be profitably introduced into the West Indies and other tropical colonial stations, but at present, unfortunately, we are still ignorant of the specific identity of this *Agave*.

A small plant, grown from one of the bulbils referred to in the previous note, is making good growth in the gardens.

LETTER from the British Vice-Consul, Vera Cruz, Mexico, to L. J. JEROME, Esq., His Majesty's Consul, Mexico.

Vera Cruz,
June 20th, 1907.

SIR,

IN view of the increasing attention that is being given to the cultivation of the Zapupe, a fibre-producing plant similar in most respects to the Henequen or Sisal hemp, the source of so much wealth to the planters of Yucatan, I have the honour to transmit herewith a short report on its cultivation and uses, more

especially as compared with the Sisal, as I believe, from the nature of the soil in which it is raised in this State, that it might be profitably introduced into some of the islands of the West Indies and other parts of the Empire within the tropics.

I have, &c.,

(Signed) L. J. NUNN,
British Vice-Consul.

THE CULTIVATION AND USES OF THE ZAPUPE IN MEXICO.

Of the many experiments that have been made with fibre-producing plants to discover one that would equal for production and results the Henequen or Sisal of Yucatan, all seem to have given but little result with the possible exception of the Zapupe, to the cultivation of which, in a limited way, a considerable degree of attention has been devoted in the State of Vera Cruz during the last three or four years. Attempts have been made, as is well known, in various parts of the world, but more especially in some of the islands of the West Indies, to raise Sisal or Henequen, but in general these attempts have been failures, the consensus of opinion being that there are certain peculiarities in the barren and arid plains of Yucatan, which, together with climatic conditions, render the land unrivalled for the cultivation of this particular class of hemp-producer. It would seem, however, that in the Zapupe a rival to the Henequen or Sisal has been discovered, that can be produced under equally as economical conditions, and which will give as good if not better results under more varied conditions of soil and climate.

Botanists, it would appear, have not yet decided on the exact classification of the Zapupe, and although it resembles in many points the Henequen, it can only be said that they are both of the Agave family.

The first experiments in the cultivation of the Zapupe were undertaken in the year 1901 or 1902 on a small scale, on some lands cleared for this purpose in the Canton of Tuxpam, in the State of Vera Cruz, where it is found in its wild state, and it is estimated that in the same vicinity there are now set out over five million plants in various stages of growth.

The cultivation of the plant requires no particular skill nor does it require much attention, a point of considerable moment in countries where labour is scarce and apt to be unreliable. The usual methods adopted are to take the young shoots when they are but a few inches high, cut them clear from the parent plant and set them out in carefully prepared nurseries, where they are allowed to remain from eight to ten months, by which time they will have assumed a height of from a foot to two feet above the ground. At this stage they are then transplanted to ordinary lands, all the preparation required being to turn the ground up with a plough and set the young plants in the furrow, banking the soil up around them so that they may be well covered. One of the reasons for this is that when the young plants are lifted from the nursery all the roots are cut off, that part where the roots

should be resembling more or less the sharp end of a tent peg, so closely are they cut down. As a rule the furrows are run in the usual parallel manner, about seven feet apart with a distance between each plant of about five feet, which would give a little over one thousand plants to the acre. Between three and four years subsequent to transplanting the plant will bloom unless pruned, when flowering will not take place for a matter of fifteen years. In order to increase the fibre producing power of the plant the flowering period must be kept in check as long as possible.

At from four to five years old the cutting of the leaves can be begun, the plant continuing to produce for a term of eight to ten years. Cutting takes place three times a year, each yield per individual plant being from about twenty-five to thirty leaves, the weight of fibre per leaf amounting to probably not quite half an ounce, so that each plant would give per year about two and one-half pounds of fibre.

From three years and onwards each plant will give off anywhere from two to a half dozen shoots and, if allowed to flower in its early stage, from the stalk which runs up from the centre to a height of twelve feet and more, it is possible to cut a hundred or more slips.

Although up to the present no extensive plant has been erected for the treatment of this fibre by machinery, there is little doubt as to the confidence in its future possessed by those engaged in its cultivation, for whereas experiments as to the possibility of its uses and production were only begun in 1901, it is safe to say that at present there are fully four to five thousand acres of ground now cleared and set out with four to five million plants in various stages of growth.

The best localities for the cultivation of the Zapupe are gently sloping plains or mountain foothills, with a soil fairly rich to poor and of not too porous a nature. Drainage must be good, as if the plants get set too long in stagnant water the roots will rot and in general the growth and production of fibre will be retarded. As the plant is essentially tropical it is perhaps needless to say that its cultivation at any considerable altitude is an impossibility; the best results in fact will be obtained where the atmosphere is warm and humid and with but slight variations in the temperature. A too sandy soil should be avoided as absorbing too quickly the surface moisture on which the shoots, especially from the parent plant, are dependent. A clayey soil again is equally as bad, as it seems to cause the roots to double and break in their endeavours to spread.

A rough estimate would show that the outlay for tending the young plants in the nursery, preparing the ground for transplanting, together with cost of the plants would be approximately :

	$
Shoots per 1,000	35.00
Sowing and tending in nursery per 1,000	7.50
Preparing ground and planting	7.50
Total	$50.00

Up to the present time the general uses to which this fibre has been applied have been limited to the making of food and game bags, lariats, and a species of gunny cloth, but more recent experiments have demonstrated its adaptability for working up into rope, and it is on this ground that several local companies have been formed and are projected for the raising of this plant on a large scale in order to compete with the Henequen or Sisal hemp growers of Yucatan, in the production of a rope-making fibre.

Comparison between the respective merits of Sisal hemp and Zapupe from the point of view of the cultivator show many points in favour of the latter if, as is hoped, the fibre of the Zapupe should prove to be equal for commercial purposes to that of the Sisal. For example, the rapid growth and development of the Zapupe is quite extraordinary. In from three to four years, in many cases, the plant will have arrived at a stage where the gathering or cutting of the leaves may be taken in hand, whereas the Henequen or Sisal takes fully six years to arrive at a condition of sufficient maturity to permit of the culling of the leaf.

From the point of view of yield of fibre the difference in favour of the Zapupe is again very marked, as the following data will show :—

———	Zapupe.	Henequen or Sisal.
Plant	1	1
Yearly yield of leaves	80	25
Cuttings per annum	3	2
Weight of fibre per leaf	½ oz.	1 oz.
Product	2½ lbs.	1½ lbs.

It will be seen from the foregoing that the Zapupe will yield in a year fully a third more weight of fibre than can be obtained from the Sisal, but on the other hand the labour and increased work entailed makes it doubtful whether the revenue derived from the extra weight of fibre produced by the Zapupe would not be more than swallowed up by the excess occasioned in expenditure. For instance, in the Zapupe three cuttings per year are necessary. Eighty leaves have to be culled and carted to the decorticating machine. The eighty leaves have to be put through the scraper three times, and the refuse to be removed is equally as great in volume, whereas with the Henequen or Sisal there are only twenty-five leaves per plant to handle from the plantation to the machine shed, the same results are obtained with two scrapings as are produced by three in the case of the other plant, so that it remains quite a question as to whether the larger quantity of fibre obtained really does offset the increase in expenditure that so much extra labour must entail, and scarcity of labour in the hotlands of Mexico, especially near the coast, is and probably will be for many years to come the most formidable difficulty that the planter of this and other produce has to contend with.

It must, however, also be borne in mind that the cultivation of the Sisal is one to which for the last thirty years and more the closest study has been given, and every possible experiment tried, with the object of increasing the yield and effecting, by improved

machinery, economies in the expenses of treatment, the result of which has been that whilst sale prices have remained at a most profitable figure, the cost of production has steadily decreased.

That there is a bright future for those engaged in the production of Zapupe, there can be but little doubt, the value of the fibre having been proved beyond the experimental stage, in addition to which it has been shown that it possesses both for toughness and tensile strength, the necessary qualities to admit of its being worked up into "binder twine," and even more profitable use than its manufacture into rope. As a matter of fact, probably over ninety per cent. of the Sisal to-day produced and exported from the peninsula of Yucatan to the United States is made into "binder twine," and even with this there is a constant demand for other raw materials as substitutes.

It may prove of interest to prospective Zapupe planters to learn the gigantic strides that have taken place in the production of Sisal during the last twenty-five years, which are shown by the following table showing the quantities and value of the exports of this produce from Yucatan alone. It is also worthy of note that at its lowest selling price of three-and-a-half cents Mexican per pound, (the Mexican cent is about equal to one farthing) there was still a margin of profit to the planter, whose gains were simply notorious throughout the country when the maximum price of nineteen-and-a-half cents Mexican per pound was attained :—

Years.	Number of Bales.	Weight in Metric Tons.	Total Value of Exports.
			£
1880	112,911	18,179	177,757
1881	154,730	24,911	272,656
1882	150,585	24,244	273,655
1883	202,805	32,651	353,750
1884	261,137	42,043	347,164
1885	267,478	43,064	333,481
1886	242,791	39,089	392,972
1887	224,865	36,283	589,442
1888	218,129	35,118	664,125
1889	252,432	40,641	1,024,369
1890	279,907	45,079	523,030
1891	323,585	52,065	657,168
1892	363,881	58,584	839,994
1893	360,857	58,097	846,713
1894	373,773	61,605	684,817
1895	383,413	61,729	611,219
1896	397,163	65,762	726,423
1897	419,975	70,545	821,869
1898	418,972	68,834	1,891,807
1899	445,978	73,190	2,021,124
1900	499,634	81,093	2,261,603
1901	517,519	83,191	2,278,345
1902	528,246	83,993	3,643,279
1903	590,430	93,058	3,333,115
1904	606,003	97,205	3,202,258
1905	597,289	96,534	2,962,543
1906	599,568	97,198	2,724,752

LXI.—ADDITIONS TO THE WILD FAUNA AND FLORA OF THE ROYAL BOTANIC GARDENS, KEW : VI.

INSECTA.

W. J. Lucas.

Since the publication of the list of the Wild Fauna of the Royal Gardens, Kew, in the *Bulletin, Additional Series* V., the following species have passed through my hands :—

Orthoptera.

The common Earwig, *Forficula auricularia*, Linn., came in large numbers to sugar, spread as a lure to Lepidoptera, on the evening of 22nd September, 1906.

Two common British short-horned Grasshoppers are new to the Kew list : *Stenobothrus bicolor*, Charp., and *St. parallelus*, Zett.

A long-horned Grasshopper—the very delicate green *Meconema varium*, Fabr., which lives on trees—came to the sugar on 22nd September, 1906, and is also new. To the same order belongs an immature *Phaneroptera* sp., taken in the Jodrell Laboratory by Mr. G. Massee ; this is not a British insect. Also belonging to the same family, the *Locustidae*, was a specimen of *Diestrammena marmorata*, de Haan, of the sub-family *Stenopelmatinae*, which is most probably a native of Japan.

Several Crickets taken by Mr. Massee in the Jodrell Laboratory are named *Gryllodes* (? *hebraeus*, Saussure), by Mr. R. Shelford ; these also are not British.

Three records of Cockroaches already published (*K.B., Additional Series* V., pp. 23, 24), are now found to need revision.

Ischnoptera sp. has been identified as *I. natalensis*, Wlk. The *Nauphoeta cinerea* of the *Bulletin* is really *N. brazzae*, Bolivar, whilst the smaller species of the same genus is *N. cinerea*, Oliv., and not *N. circumvagans*. The last two are now figured.

Neuroptera.

Of Dragon flies I have received four species taken in the Gardens—one *Sympetrum striolatum*, Charp., captured by Mr. G. Nicholson, August, 1907 ; *Ischnura elegans*, Lind., two males ; *Enallagma cyathigerum*, Charp., one female ; *Aeschna cyanea*, Müll., one male. Only the first, however, is new to the list.

One specimen of the extremely useful green Lacewing, *Chrysopa vulgaris*, Schn., was taken on the wing in the evening of 22nd September, 1906, and three others were sent to me by Mr. Nicholson—the first Kew record of this group. Since then Mr. Nicholson has sent me a specimen of the less common *Ch. tenella*, Schn., and on the evening of 21st June, 1907, I took in the Gardens two specimens of a brown Lacewing, *Hemerobius lutescens*, Fabr. *Sialis lutaria*, Linn., the Alder-fly, also belonging to this group, was taken by Mr. A. Sich beside the Lake on 16th May, 1907.

At last a few Caddis-flies (*Trichoptera*) have been taken. *Halesus radiatus*, Curt., sent by Mr. Nicholson; *Phryganea grandis*, Linn., one undated male from Mr. Nicholson, and a pair taken *in cop.* by Mr. Sich on a tree-trunk in the Arboretum, 6th July, 1907; a female *Mystacides longicornis*, Linn., sent by Mr. Nicholson; and *Leptocerus aterrimus*, Steph., also from Mr. Nicholson. (Mr. K. J. Morton kindly assisted with the identification of a few of the Neuroptera.)

Hymenoptera.

The very handsome *Chrysis ignita*, Linn., a common parasite on various Hymenoptera and very variable in size. It was sent by Mr. Nicholson, who obtained it at Queen's Cottage. (Mr. E. Saunders examined it.)

A small male of *Apanteles juniperatae*, Bouché, a parasite bred from larvae of *Urapteryx sambucata*, Linn., 5th September, 1906. Mr. Claude Morley, who examined it, says it is not a very common species, and has not been bred from this host before, though it has been reared from the allied *Odontopera bidentata*, Linn.

Coleoptera.

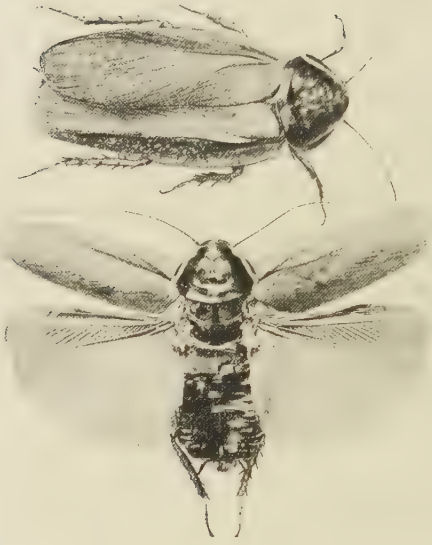
Helops striatus, Fourc., and *Dromius meridionalis*, Dej., taken when sugaring on 22nd September, 1906. (Examined by Mr. F. B. Jennings.) The former appears in the earlier list.

A large living beetle bred from a pupa which reached the Gardens in a Wardian case from Tobago, 29th August, 1906. Mr. G. J. Arrow, who examined it, says that it belongs to the family *Dynastidae*, and is a member of the genus *Strategus*. Being a female its species cannot be properly determined.

Tropical Cockroaches.

W. Watson.

The tropical plant houses at Kew are infested with cockroaches which are only prevented from doing a great deal of damage to the plants by constant trapping. At least three species are injurious, namely, *Blatta orientalis*, Linn., *B.* (*Periplaneta*) *americana*, Linn., and *B.* (*P.*) *australasiae*, Fab., the second being the largest and the third by far the most abundant. Their haunts are dry holes and corners about the stages and hot-water pipes, the sheathing bases of palm, banana and pandanus leaves, and among the crocks in large plant-pots and tubs. They are in hiding during the day, but at night they come out and run or fly about among the plants, devouring flowers and leaves like rabbits. Such plants as *Eucharis*, *Crinum* and *Alpinia*, when in flower, have little chance in the palm house, where the cockroaches are most abundant; they also find out the ripening bananas and soon devour them. They are as clever as mice in scenting food and more clever in learning what to avoid in the shape of a trap or poison. Jars with a little treacle at the bottom will trap them for a few weeks, then the bait must be changed to beer, linseed oil or sugar and water, otherwise the cockroaches cease to be attracted. Poisons, such as phosphorus paste or "Beetle-cute," have no



1.

3.

2.

4.

W. J. Lucas. Photo.

[*To face page* 403.

terrors for these pests. We once caught about a score and put them into a box with nothing but "Beetle-cute" to feed upon, but they lived happily enough until they grew so hungry that they began to devour each other. We have caught as many as 400 in one night in the palm house, and as they appear to be vegetarians as a rule and to eat a great deal of food it will be seen how troublesome they may become in large plant houses. In the smaller houses they give less trouble, because they can be more easily kept down. They breed very rapidly and the young start foraging very early.

Fresh importations of cockroaches sometimes accompany packages of plants, &c., from tropical countries ; it is probable, however, that they get into the packages during transit, as they are known to infest the steamers which ply between the tropics and this country. They are also numerous in some warehouses.

Although not known to be mischievous, but with habits that justify suspicion, a fourth species, *Leucophaea surinamensis*, here figured, infests the cocoa-nut fibre beds in the tropical propagating houses, where it is sometimes very abundant. It buries itself in the loose fibre with astonishing facility, disappearing with diver-like action. The only method we have tried for its destruction is hand-catching.

EXPLANATION OF THE PLATE.

All the figures are natural size.

Fig. 1. *Nauphoeta brazzae*, Bolivar.

Fig. 2. *Nauphoeta cinerea*, Oliv.

Fig. 3. *Blatta orientalis*, Linn.

Fig. 4. *Leucophaea surinamensis*, Linn.

LXII.—MISCELLANEOUS NOTES.

MR. CRAWFORD NOBLE has been appointed by the Secretary of State for the Colonies, on the recommendation of Kew, Assistant Forest Officer in Cyprus. Mr. Noble holds the Diploma in Agriculture of the University of Aberdeen, and has studied Forestry in the French École Nationale des Eaux et Fôrets at Nancy.

MR. WILLIAM WRIGHT SMITH, M.A., Assistant to the Professor of Botany in the University of Edinburgh since 1902, has been appointed by the Secretary of State for India in Council, on the recommendation of Kew, Curator of the Herbarium of the Royal Botanic Gardens, Calcutta, in succession to Capt. A. T. Gage, I.M.S.

MR. WILLIAM JAMES DOWN, a member of the gardening staff of the Royal Botanic Gardens, has been appointed by the Secretary of State for the Colonies, on the recommendation of Kew, Agricultural Instructor and Assistant Superintendent of the Hope Gardens and Experiment Station, Jamaica.

We regret to notice the death of Major J. T. CRAMER, R.G.A., which occurred at the village of Adonikia, Sierra Leone, on the 3rd of February last. Major Cramer spent about five weeks at Kew during June and July of last year, when he received instruction in systematic and economic botany with special reference to the colony of Sierra Leone. He was a keen and intelligent observer, and had acquired an extensive knowledge of the natural products of the colony. The instruction he received here, added to his already accumulated information, had fitted him to do useful work in the interests of the colony which, owing to his untimely death, has not been able to be realised.

W. R. BUTTENSHAW.—News has been received at Kew of the death, in September last, of Mr. W. R. Buttenshaw, M.A., B.Sc., the recently appointed Economic Botanist for the Bengal Agricultural Department. Mr. Buttenshaw was appointed, in 1899, Lecturer in Agriculture for Jamaica (*K.B.*, 1899, p. 220). In 1903 he was transferred to the Imperial Department of Agriculture for the West Indies as Scientific Assistant. This post he relinquished in the early part of this year to take up the Indian appointment. He had only been a few days in Calcutta when he fell a victim to heat-stroke. Mr. Buttenshaw had done much good work in the Colonial service and his tragic death, at the early age of 30, has cut short a career of much promise.

The Seeding of the English Elm (*Ulmus campestris*, L.).—The right of *Ulmus campestris* to a place in the British Flora has long been disputed. The fact that it was never found to produce fertile seed, and that its perpetuation in the British Isles appeared to be accomplished solely by means of root-suckers has naturally supported the view that it is an alien. It may be mentioned in passing, however, that the absence of the faculty of reproduction by sexual agency does not, in itself, absolutely prove that a tree is foreign to the country where it grows. A familiar instance is the Rose Acacia (*Robinia hispida*, L.), which had been known for many years, both wild and cultivated, before it was discovered bearing seeds. Instances have been found on plants growing wild on the Alleghanies, but even now they are exceedingly rare. Practically, the species has lost the power to reproduce itself except by suckers. These, however, as in the case of the Elm, are produced so plentifully that the production of seeds is no longer essential for the perpetuation of the species. With regard to *Ulmus campestris* there is no record of its having produced fertile seed in England, and when, in a communication received at Kew from Lady Rayleigh, it was stated that a large number of young seedlings had sprung up in the grounds at Terling Place, in Essex, the question appeared to deserve investigation. A visit was accordingly paid on Sept. 10th, 1907.

From the number of young seedlings, many still carrying the cotyledons, which were to be found on such places as rubbish heaps, garden borders, in workmen's gardens and even in the

woods, it was evident that a large quantity of fertile seed had ripened earlier in the year.

From an examination of the trees, however, it was evident that they were not *Ulmus campestris* in the common acceptation of the term. The adult leaves were glabrous, except in the axils of the veins beneath, as were also the shoots of the year. These characters as well as the shape of the leaves point to an affinity with *Ulmus glabra*. On the other hand strong sucker growths from near the base of the trunk bore leaves that were pubescent on every part. No clearly defined line separates *U. glabra* from *U. campestris*. There are several forms that may as reasonably be put under one as the other. The Terling Place Elm appears to be *U. glabra* with a certain leaning towards *U. campestris*.

The tree is quite common in the district. The hedgerows are lined with it, it is the common tree of the woodland, and there is a picturesque group in the village of Terling. In the open, it forms a short, thick trunk, then divides into a number of spreading limbs, the final subdivisions of the branch being long, thin and pendulous. In some specimens this slender, pendant habit is extraordinarily developed, giving the tree a singularly beautiful, fountain-like appearance—an appearance quite distinct from the more columnar, lumpy aspect of the ordinary *U. campestris*. Grown closely together it makes fine straight timber such as the forester loves. A specimen of the more spreading sort was approximately 95 feet high and 15 feet in girth of trunk.

Judging from the abundance of the tree in the district, and the fact of its seeding freely (for from evidence supplied by residents, this is a common occurrence), it appears reasonable to conclude that this tree is a genuine native of this part of Essex. The presence of young trees of various ages would have supported this view. But their absence from the area inspected during a short visit is easily accounted for by the ordinary garden operations of digging, scything, &c. An examination of a wild, uncultivated patch of woodland might reveal the presence of older trees of seedling origin.

Interesting as is the abundant production of fertile seeds by the elms at Terling, it leaves untouched the question of the sterility of the true *Ulmus campestris* in England. A genuine instance of fertile seeding has yet to be recorded, if not discovered. Seeing that the tree seeds in France, there would appear to be no reason why it should not do so in Britain, provided the climatic conditions were suitable. It flowers freely every year, and one would imagine that some time or other, however rarely, a season suitable for seed production would occur. On the other hand, propagation for centuries by root-suckers alone may have perpetuated a functionally sterile strain. In connection with this question, the occurrence of seedling elm plants at King's College, Cambridge, deserves to be mentioned. On the top of the stonework of the gateway leading into the "Backs" a number of young elms are growing in the crevices, and there is every reason to believe that they have grown there from seed blown from the ancient elm trees near. Judging from their foliage alone, which is scabrid above and pubescent on both surfaces, these young trees would appear to be *U. campestris*. But leaves alone do not provide

adequate evidence of identity, especially if derived from juvenile trees, whose leaves are frequently much more pubescent than those of the adult tree. The publication of this note may direct attention to the matter and bring instances of the natural reproduction of *U. campestris* by seed to light. The part of the country in which this is most likely to occur is East Anglia, with its drier and more sunny climate.

W. J. B.

The seeding of the English Elm being so uncommon, it has been thought advisable to supplement the foregoing note with figures and descriptions of the authentic seedlings therein mentioned :—

The figure represents one of the seedlings from Terling Place, drawn to the natural size, together with an enlarged view of the base of a cotyledon seen from behind. The stem, cotyledons and leaves are hairy, the upper surfaces of the leaves being more hairy than the lower. The cotyledons are about $\frac{3}{8}$ to $\frac{7}{16}$ of an inch long by $\frac{1}{4}$ to $\frac{5}{16}$ inch broad, obovate-obtuse in outline and with pronounced auricles at the base.

It is of interest to notice that the foliage leaves of the young seedling are arranged in pairs, and it appears to be some time before the characteristic alternate arrangement of the adult tree is assumed. The dentation of the leaves is also of a simple type. A comparison of these seedlings with those figured by Hempel and Wilhelm* shows that the auricles of the cotyledons are typical of the seedlings of the genus *Ulmus*.

From their figures of the seedlings of *U. campestris*, *U. montana* and *U. effusa*, it appears that the cotyledons are similar in all cases, but the first foliage leaves are somewhat different in the three species, those of *U. montana* being larger and more definitely pointed at base and apex than those of *U. campestris*, whilst those of *U. effusa* are more decidedly ovate in outline and have more pronounced teeth. In all cases the first foliage leaves show a decussate arrangement.

The first layer of cork is beginning to be shed from the hypocotyl of the seedling figured on the opposite page.

* Hempel & Wilhelm, *Bäume und Sträucher des Waldes, Vol. III.* Vide *U. campestris*, p. 2, and Taf. xxxvii., Fig. 3 ; *U. montana*, p. 7, and Taf. xxxviii., Fig. 3 ; *U. effusa*, p. 9, and Taf. xxxix., Fig. 3.

For comparison with the Terling Place seedling a natural size drawing of a twig of one of the seedling Elms from the "Backs" Gate of King's College, Cambridge, is reproduced.

The young twigs, petioles, and the veins on the lower side of the leaf are covered with hairs, and both surfaces of the leaf lamina are also hairy.

The leaves have assumed the normal alternate arrangement and the dentation of the laminae is like that of the leaves of an adult tree. The general shape of the leaves agrees with those of *Ulmus campestris*,* though their hairiness is like that of *U. montana*, the latter character, however, appears to be correlated with the juvenile condition and does not therefore indicate that these seedlings are those of the Wych Elm.

Seedlings of the true *U. campestris* grown in the Gardens from seed collected by Mr. A. Henry in France prove to be very variable in character, the seeds being from the same tree. In all cases the leaves are hairy on both surfaces, and some of the specimens are remarkably similar to the Cambridge seedlings.

It seems highly probable, therefore, all things considered, that the "King's College" s edlings are those of the true *U. campestris*.

Sterculia rhinopetala.—Flowering specimens of a Sterculiaceous tree from Lagos were received from Mr. Cyril Punch in 1901, and were referred provisionally to *Cola*. In 1907 fruiting specimens of the same species, collected in Southern Nigeria by Mr. E. W. Foster, were received, and it was found, on examination of the seed, that the species belonged to the genus *Sterculia*, and was *S. rhinopetala*, K. Schum.

According to Zenker (K. Schumann in *Engler's Monogr. Afr. Pflanzen-familien*, vol. V., p. 102), the seeds of *S. rhinopetala* are used as Cola at Yaunde in the Cameroons. The accuracy of Zenker's statement is called in question by Schumann—firstly, because Zenker gave the number of seeds as 10–12 per follicle, whereas only 5 ovules were found in each ovary by Schumann; he considered therefore that the fruit could hardly belong to the flowering specimens. Secondly, because *S. rhinopetala* is a true *Sterculia*, he thought that its seeds could hardly be eaten, inasmuch as the seeds of *Sterculia* have a hard seed coat and an oily albumen.

The follicles collected by Foster contain, however, from seven to nine seeds each, and it is recorded in *Watt's Dictionary of Economic Products*, Vol. VI., part iii., pp. 362–5, that the seeds of *S. foetida*, *S. guttata* and *S. urens* are roasted and eaten like chestnuts, especially in times of scarcity. We are also informed by Dr. Hochreutiner that he has eaten, whilst at Buitenzorg, the seeds of several species of *Sterculia* (proper), and found them pleasant.

---

* *Cf.* Hempel & Wilhelm, l.c., Vol. III. *Ulmus campestris*, Spach., p. 2, and Taf. xxxvii., Fig. 2; *U. montana*, Smith, p. 7, Figs. 230, 231, and Taf. xxxviii., Fig. 2.

Sterculia rhinopetala is a large forest tree and is said to attain a height of more than 100 feet. Schumann gives the height as 25–35 metres, Foster says "up to 100 feet," and Punch describes it as a large tree. In Lagos it is known by the names *Orodu* and *Oro* (*Punch*). Its distribution as at present known is as follows :—

LAGOS. Ibadan Forest Reserve, *Punch*, 106.

S. NIGERIA. Ilara, *Foster*, 172.

CAMEROONS. Yaunde, *Zenker*, 606.

S. rhinopetala is interesting botanically, inasmuch as the androecium consists of two irregular rows; in *Sterculia* the anthers are usually crowded together without order into a head, and in *Cola* they are arranged in one or two very regular rows, so that in this respect *S. rhinopetala* exhibits intermediate characters.

The sessile ovaries and sessile stigmas are, according to Schumann, characteristic of *S. rhinopetala*.

T. A. S.

Botanical Magazine for October.—The plants figured are : *Ferula communis*, Linn. var. *brevifolia*, Mariz, *Rosa Soulieana*, Crépin, *Iris verna*, Linn., *Bulbophyllum dichromum*, Rolfe, and *Paeonia Cambessedesii*, Willk. The *Ferula* is an interesting plant. A rootstock, which produced the plant figured, was sent to Kew in 1886 by Vice-Consul G. P. Hunot, from Saffi, Morocco, and, owing to its successful cultivation, it has been possible to determine that the gum ammoniac (Fashook) of Morocco is obtained from *Ferula communis*. A full account of the history of gum ammoniac is included in this number of the *Kew Bulletin*. *Rosa Soulieana* is a vigorous-growing species with rather small, ivory-white flowers and attractive ovoid or almost globose, orange-vermilion fruits. It has been introduced into cultivation from Western China by Messrs. de Vilmorin, from whom Kew received it in 1899. The discoverer of this pretty rose was the Abbé Soulié, who was attached to the Catholic Mission at Yerkalo, on the Tibetan-Chinese frontier; he was murdered by Tibetan fanatics at Batang in Szechuen, in the latter part of June, 1905 (see *Journal of Botany*, 1905, p. 368). *Iris verna* is an old inhabitant of English gardens, having been in cultivation as long ago as 1739. The specimen figured was received from Mr. R. I. Lynch, Curator of the Botanic Garden, Cambridge. It is a native of the Eastern United States. The *Bulbophyllum* is a particularly attractive species from Annam, whence it was introduced by Messrs. F. Sander & Sons, of St. Albans. The specimen figured came from Mr. F. W. Moore, of the Royal Botanic Garden, Glasnevin, where a plant flowered in February last. The dark purple of the lip contrasts very strikingly with the deep yellow of the rest of the flower. *Paeonia Cambessedesii* is a native of the Balearic Islands and Corsica, the introduced plants having been collected in the Island of Majorca by Miss Frances Geoghegan, of Glasnevin, Dublin. The drawing

was prepared from a flowering specimen produced by an offset from Miss Geoghegan's original plant, which was sent to Kew in April of the present year. Its flowers are deep rose-pink.

The Flora of the Bombay Presidency.—The fourth and penultimate part of the second volume of Dr. T. Cooke's work, prepared at Kew and bearing the above title, was published in July. It contains the families *Euphorbiaceae* to *Araceae*, in part as to the first and last, and comprises pages 625 to 816; thus the second volume already exceeds the first by 170 pages. But those who use the book will not be disposed to criticism on this point, as much useful information is added to the purely descriptive matter. It is interesting to note that there are no *Coniferae*, *Cycadaceae*, or *Casuarinaceae* indigenous to the Bombay Presidency, but the author includes brief descriptions and gives references to figures of the principal species belonging to these families found in gardens. This course is followed under all the families for useful and ornamental plants, as well as prominent weeds.

Taking the whole of India, Orchids are far more numerous in species than any other family. In the Bombay Presidency they number only 73 species, belonging to 31 genera, 17 of which are represented by only one species each. *Habenaria* (17 species) is the only genus represented by more than five species. *Peristylus*, five species, and *Platanthera*, one species, are restored to generic rank. Judging from various deviations from other authorities, Dr. Cooke has worked on careful and critical lines. Taking the genus *Musa* as an example, *M. zebrina*, Van Houtte, regarded by Baker as a variety of *M. sapientum*, is given specific rank. *M. paradisiaca*, Linn., has been made the type, and *M. sapientum* the variety, for reasons stated. Some previous botanists have treated them inversely. There are also many valuable notes on some of the other cultivated species. *M. rosacea*, Jacq., and *M. superba*, Roxb., are the only indigenous species.

W. B. H.

The Orchids of the Malay Peninsula.—The first part of the Materials for a Flora of the Malayan Peninsula, by H. N. Ridley, M.A., F.R.S., Director of the Botanic Gardens, Singapore, is devoted to the Natural Orders *Hydrocharidaceae*, *Orchidaceae* and *Apostasiaceae*. Of *Hydrocharidaceae* six species are enumerated, belonging to as many genera, and thus the bulk of the work is devoted to *Orchidaceae*, for it is better to consider the *Apostasiaceae*—here treated as a distinct Order—as an ancestral tribe of *Orchidaceae*, since they are less distinct from *Cypripedieae* than are the latter from the great sub-order *Monandreae*. In fact, Mr. Ridley's definition of *Orchidaceae* would exclude *Cypripedieae* from that Order so far as the pollen, stigmas and rostellum are concerned. The *Orchidaceae*, in the sense of Bentham and Hooker's *Genera Plantarum*, form a very large and important element in the Flora, 546 species being enumerated, arranged in 90 genera. Of this

number 280 species, or just over half, are considered endemic, though it is probable that when the adjacent parts of the Archipelago have been better explored the proportion may be considerably modified. The area covered is not defined, but apparently includes the Peninsula from the northern boundary of Ligor, with the islands of Penang, Langkawi, Singapore, and a few others lying close to the coast of the Peninsula.

The arrangement followed is substantially that of Bentham and Hooker's *Genera Plantarum*, with the exception of the exclusion of the *Apostasiaceae*. There are several modifications for example, the sub-tribe *Ericae* is abolished, *Eria* and *Phreatia* being referred to *Dendrobieae*, and *Spathoglottis* to *Bletieae*. The latter tribe is enlarged by the inclusion of *Chrysoglossum*, *Collabium*, *Plocoglottis*, *Spathoglottis*, *Calanthe*, *Arundina* and *Dilochia*, which were scattered in four different sub-tribes in the Genera Plantarum. *Agrostophyllum* and *Ceratochilus* are transferred from *Coelogyneae* to *Dendrobieae*. *Geodorum*, *Thecostele* and *Polystachya* are removed from *Cymbidieae*—the first to *Eulophieae*, the second to *Notylieae*, and the third to a new sub-tribe, *Polystachyeae*, in which the anomalous genus *Leucolena*, Ridl., is now included. *Podochilus* (including *Appendicula*), *Thelasis* and *Oxyanthera* are separated from *Notylieae* as sub-tribe *Podochilineae*. Of the tribe *Neottieae* only two divisions are recognised, *Listereae* and *Goodyereae*, the former absorbing *Vanilleae* and *Arethuseae* and the latter *Corymbieae*, while two Indian genera included by Bentham in *Diurideae* are divided between them, *Neottieae* taking *Corysanthes*, while *Cryptostylis* goes into *Goodyereae*.

Two new genera appear here, *Podephyllum* and *Ascotainia*, the first based on *Agrostophyllum pauciflorum*, Hook. f., and *Eria minutiflora*, Ridl., and the second on *Tainia penangiana*, Hook. f. The latter genus is said to include two other species not belonging to this Flora, namely, *T. Hookeriana*, King & Pantling, and *T. viridifusca*, Lindl. *Dendrobium* is the largest genus, of which 73 species are enumerated, and this is closely followed by *Bulbophyllum* (including *Cirrhopetalum*) with 68, *Eria* with 49, and *Saccolabium* (including *Cleisostoma* and *Sarcanthus*) with 35. *Coelogyne* has 21 species and *Oberonia* 20, while no fewer than 28 genera are represented by only a single species.

The union of *Sarcanthus* and *Cleisostoma* with *Saccolabium*, though not made for the first time here, invites some comment, for Mr. Ridley still utilises them as natural sections of the larger genus, apparently without taking into account the difficulty of separating *Saccolabium* from *Angraecum* by absolute characters; he also retains *Acampe*, which had been united with *Saccolabium*. In fact there seems to be a modern tendency to excessive splitting on the one hand and undue agglomeration on the other—even within the limits of the same work—and the latter sometimes tends to "chaotic agglomerations of forms under a common generic name."

A few minor details may be pointed out. *Dendrobium Dalhousieanum*, Wall., is now well-known to be *D. pulchellum*

Roxb. *Cirrhopetalum gracillimum*, Rolfe, antedates *C. psittacoides*, Ridl., by over a year, and if *Cirrhopetalum* must be merged in *Bulbophyllum* the species must stand as *B. gracillimum*. *Coelogyne tomentosa*, Wawra, is Lindley's plant of the same name, and both it and *C. Massangeana*, Reichb. f., are quite distinct from *C. Dayana*, Reichb. f. In short *C. Dayana*, Ridl. (not of Reichb. f.), is, by his own cited specimens, *C. tomentosa*, Lindl. Mr. Ridley is probably correct in uniting his *Cymbidium acutum* and *C. Simonsianum*, King & Pantl., though the latter should have been adopted as the earlier name. Fortunately both are antedated by *C. Dayanum*, Reichb. f., described a quarter of a century earlier. *Renanthera alba*, Ridl., is *R. Hookeriana*, Reichb. f. A very curious circumstance about *Neuwiedia Curtisii*, Rolfe, is recorded by Mr. Ridley, namely, that it differs from its allies in its fruit being a "red, succulent berry," not a capsule, and he identifies with it the *Tupistra* (?) *singapureana*, Wall. Cat. n. 5,195. A comparison with the unique fruiting specimen in the Wallichian Herbarium now confirms the determination, though, so far as can be seen from the dried specimen, which has been somewhat damaged by insects, the structure of the fruit and seeds does not differ in other respects. The history of the species is thus carried back for over 60 years, and the name should now stand as *Neuwiedia singapureana*.

The work forms an important contribution to Orchidology.

R. A. R.

Welwitschia.—In connection with Professor Pearson's account of his recent journey published in the last number of the *Bulletin*, the distribution of *Welwitschia* in German South-West Africa is discussed in some detail (*Kew Bulletin*, No. 9, p. 347). It should not be forgotten, however, that Welwitsch discovered this plant in Angola near Cape Negro (lat. 15° 40′ S.), in the year 1860. During the autumn of 1861 and before Welwitsch's specimens reached Kew, sketches and material of the same plant were received from Baines, and also from Anderson, in Damara-land at a spot about 500 miles to the south of Cape Negro. Both these collections together with additional material sent to Kew by Monteiro are described and figured in the *Transactions of the Linnean Society*, vol. 24, p. 1, by Dr. J. D. Hooker, and form the material on which the genus *Welwitschia* was founded. According to Monteiro, the northern limit of the genus is about 14° S. lat. in the neighbourhood of Mossamedes, and a short account of the finding of the plant, together with a plate, is given by him in his book *Angola and the River Congo*, vol. II., pp. 228–231, pl. XV.

Erratum.—Page 360 and cover of No. 9, *for* "Diagnoses Africanae: XIX." *read* "Diagnoses Africanae: XX."

INDEX.

A.

Abbott, F., 72.
Acacia pallens, *Rolfe*, 361.
Acanthosicyos horrida (with plate), 343.
Aconitum Gammiei, *Stapf*, 56.
— gymnandrum, 71.
— Napellus, var. eminens, 372.
Adenium oleifolium, *Stapf*, 53.
— swazicum, *Stapf*, 53.
Adenophora polymorpha, 9.
African mahogany, 64.
— oak, 64.
— tree rubber, 187.
Agave (Littaea) Watsoni, *J. R. Drummond et C. H. Wright*, 322.
Algae, marine, from Chatham Islands, 37.
—, —, new or little-known, from the East (with plate), 260.
Aloe campylosiphon, 200.
— nitens, 337.
— pallidiflora, 140.
American rubber plants, 153.
Andropogon (§ Arthrolophis) Bentii, *Stapf*, 224.
— cyrtocladus, *Stapf*, 209.
— Ischaemum, var. somalensis, *Stapf*, 210.
Angraecum infundibulare, 372.
Annals of the Royal Botanic Garden, Calcutta, 32.
Anthemis Ballii, *Stapf*, 367.
Anti-opium plants, 198.
Apples, Cape, Bitter pit in, 142. 250.
Appointments :—
Brown, T. W., 18.
Butcher, F. H., 246.
Down, W. J., 403.
Gallagher, W. J., 100.
Hill, A. W., 296.
Morton, A., 72.
Noble, C., 403.
Smith, W. W., 403.
Stroud, E. G., 246.
Aralia quinquefolia, var. Ginseng, 73.
Arctostaphylos Manzanita, 141.
Aristida somalensis, *Stapf*, 216.
Ascochyta Cookei, *Massee*, (with fig.), 241.
Ashton Court, 395.

B.

Bamboos, cultivated, flowering of, 228.
Bassia, Malayan species of, 112.
Benthamiana, 200.
Berkheya (§ Stobaea) macrocephala, *J. M. Wood*, 50.
Bigelovia graveolens, 372.
Bignoniaceae, reductions of Wallichian herbarium, 16.
Bird's nest from Trinidad, 70.
Bitter pit in Cape apples, 142, 250.
Blepharocalyx spiraeoides, 140.
Boehmeria nivea in Tirhut, 4.
Bombay Presidency, Flora of, 410.
Books :—
Annals of the Royal Botanic Garden, Calcutta, 32.
Botanical Magazine, 29, 71, 106, 140, 141, 200, 248, 336, 337, 372, 409.
Bromeliaceae Andreanae, 304.
Diagrams of Plant Diseases, 202.
Flora of Bombay Presidency, 410.
Forests and Forest Flora of the Cape, 303.
Guide to Museum I., 300.
Hooker's Icones Plantarum, 30.
Indian Trees, 30.
London Botanic Gardens, 305.
Materials for Flora of Malay Peninsula, 109.

Books—*cont.*
Orchids of N. W. Himalaya, 32.
Rubber Cultivation in the British Empire, 304.
— in the East, 107.
Botanic Garden, Hobart, 72.
— —, Liverpool, 65.
— Gardens, London, 305.
Botanical Magazine, 29, 71, 106, 140, 141, 200, 248, 336, 337, 372, 409.
Brandis, Sir D., "Indian Trees," 30.
Brazilian Linen Plant, 338.
British East Africa, Mgoa rubber in, 283.
— Empire, rubber cultivation in, 304.
— Somaliland, grasses of, 203.
Bromeliaceae Andreanae, 304.
Bromus scoparius, var. stenantha, *Stapf*, 369.
Brown, T. W., 18.
Bruckenthalia spiculifolia, 337.
Bulbophyllum dichromum, *Rolfe*, 128, 409.
— tridentatum, *Rolfe*, 128.
Burdett-Coutts, Baroness, 18.
Burkill, I. H., alpine notes from Sikkim (with plate), 92.
Butcher, F. H., 246.
Buttenshaw, W. R., 404.
Butter-nuts, 344.

C

Cacao seeds, treatment of, for export, 297.
Caesalpinia vernalis, 200.
Caiophora coronata, 140.
Calabash tobacco pipes, 299, 374.
Calanthe burmanica, *Rolfe*, 129.
Calathea angustifolia, 337.
Calcutta, Annals of the Royal Botanic Garden, 32.
Calliandra portoricensis, var. major, 141.
Calyptospora Goeppertiana (with plate), 1.
Camphor, distillation of, 88.
Candle-snuff fungus, 108.
Canhamo Braziliensis Perini, 338.
Cape apples, bitter pit in, 142, 250.
— , Forests and Forest Flora of, 303.
Cardiff Castle, 389.
— Public Parks, 395.
Castilloa, 156.
Catalpa Bungei, 102.
— cordifolia, 43.
— speciosa, 43.
— , the Western, 43.
Cecropia, illustrations of, 106.
Ceylon, Funtumia rubber in, 189.
— Rubber Exhibition, 34.
Chatham Islands, marine algae from, 37.
China, Sassafras in, 55.
Chinese species of Eriocaulon, 3.
Chlamydites, a new genus of Compositae, 90.
— Prainii, *Drummond*, 91.
Chrysophyllum Roxburghii, 109.
Cienfuegosia heteroclada, *Sprague*, 48.
Cinnamomum Camphora, 88.
Clarke, C. B., a memorial of, 71.
Cleisostoma secundum, *Rolfe*, 131.
Cleome densifolia, *C. H. Wright*, 360.
Clerodendron (Cyclonema) phlebodes, *C. H. Wright*, 54.
Cliffortia natalensis, *J. M. Wood*, 362.
Clonostachys Simmonsii, *Massee* (with fig.), 242.
"Cluster-cup," disease of Conifers (with plate), 1.
Clyne Castle, 393.
Coca, a substitute for, 136.
Cockroaches, tropical (with plate), 402.
Codonopsis Tangshen (with plate), 9.
Coelogyne Mooreana, *Hort. Sand.*, 129.
Collybia lutea, *Massee*, 122.

Combretum sundaicum, 198.
Conifers, "cluster-cup" disease of (with plate), 1.
Coorongite, 145.
Cordeauxia, *Hemsl.*, gen. nov., 361.
— edulis, *Hemsl.*, 361.
Corea, Ginseng in, 73.
Coreopsis bella, *Hutchinson*, 364.
Cotton at Liverpool, 62.
— seeds, disinfecting, 299.
Cramer, Major J. T., 404.
Cricket bat willow (with plates), 311.
Crimson-cup fungus, 108.
Cymbidium erythrostylum, 141.
— pumilum, *Rolfe*, 130.
Cyperaceae of the Philippines, 305.
—, reductions of Wallichian herbarium, 264.
Cyrenaica, Gums Ammoniac of, 375.

D.

Daedalea papyracea, *Massee*, 124.
Dalbergia Lacei, *Prain*, 58.
Dasyscypha coccinea, 108.
Dasystachys nervata, *C. H. Wright* 55.
Davidia, 301.
Decades Kewenses, 56, 316.
Delphinium macrocentron, 337.
— (Macrocentra) Wellbyi, *Hemsl.*, 360.
Dendrobium Ashworthiae, 248.
Diagnoses Africanae, 45, 360.
Diagrams of plant diseases, 202.
Didymosphaeria tetraspora, *Massee*, 124.
Diospyros Kaki, 141.
Disa Bakeri, *Rolfe*, 132.
Diseases of Plants :—
Bitter pit in Cape apples, 142, 250.
"Cluster-cup" disease of Conifers (with plate), 1.
Calyptospora Goeppertiana, 1.
Diagrams of Plant Diseases, 202.
Diseases of Plants—*cont.*
Investigations in, 139.
Potatoes, degeneration in (with plate), 307.
Dixon, Abraham, 246.
Down, W. J., 403.
Dubouzetia, a revision of, 125.
— acuminata, *Sprague*, 58, 127.
— campanulata, 127.
— caudiculata, *Sprague*, 57, 127.
— elegans, 128.
— leionema, *Sprague*, 127.
Dysoxylum pachyphyllum, *Hemsl.*, 58.

E.

East Africa, Funtumia rubber in, 189.
Economic notes, Liverpool, 61.
Ehretia trachyphylla, *C. H. Wright*, 53.
Elandsbontjes, 371.
Elephantorrhiza Burchellii, 371.
Elm, English, seeding of (with figs.), 404.
Entada spiralis, stem of, 106.
Eriocaulon, Chinese species of, 3.
Erodiophyllum acanthocephalum, *Stapf*, 318.
Errata, ii., 412.
Eupatorium glandulosum, 248.
Euphorbia fulva, 294.
Euptilota Fergusonii, *Cotton* (with plate), 262.
Exosporium laricinum, *Massee* (with fig.), 242.

F.

Falkia canescens, *C. H. Wright*, 54.
Ferula communis, var. brevifolia, 375, 409.
— marmarica, 375.
Fibres :—
Canhamo Braziliensis Perini, 338.
Sansevieria grandis, 369.
Zapupe, 396.

Fiji, Mikania scandens in, 306.
Flora of the Bombay Presidency, 410.
Florula Marmarica, additions to, 365.
"Forests and Forest Flora of the Cape," 303.
Foster, Sir M., 65.
Fruit at Liverpool, 63.
Fungi as decorative plants, 108.
— Exotici, 121.
—, new and additional species of (with plate), 238.
Funtumia elastica, 187, 249.

G.

Gallagher, W. J., 100.
Gamble, J. S., Gutta Percha trees of the Malay Peninsula, 109.
Geigeria Wellmanii, *Hutchinson*, 49.
Gentiana ornata, 248.
German South-West Africa, notes on a journey in, 339.
Gesneraceae, reductions of Wallichian herbarium, 94.
Ginseng in Corea, 73.
Glaziou, A. F. M., 66.
Grasses, hints for the collection of, 226.
—, mud-binding, 190.
— of British Somaliland, 203.
Guayule rubber, 285.
Guide to Museum I., 300.
Gum, Sudan, 23.
Gums ammoniac of Morocco and the Cyrenaica, 375.
Gutta percha, measures for increasing supply of, 117.
— — trees of the Malay Peninsula, 109.
Gymnogramme (Eugymnogramme) hirtipes, *C. H. Wright*, 61.
Gynura ovalis, 199.

H.

Hanbury, Sir T., 132.
Haviland, G. D., 197.
Haworthia Pearsoni, *C. H. Wright*, 365.
Heaths, hardy, at Kew, 101.
Helichrysum argentissimum, *J. M. Wood*, 364.
Hemiptera-Homoptera, Newstead, 97.
Hendre, 388.
Herbertia Amatorum, *C. H. Wright*, 321.
Hevea, 153.
Hibiscus Allenii, *Sprague et Hutchinson*, 45.
— gossypinus, 48.
— Hildebrandtii, *Sprague et Hutchinson*, 46.
— radiatus, 338.
— shirensis, *Sprague et Hutchinson*, 47.
Hill, A. W., 296.
Himalaya, North-Western, orchids of, 32.
Hobart Botanic Garden, 72.
Hoodia Currori, 200.
Hooker, Sir J. D., Linnean Bicentenary Gold Medal, 256.
—, — — —, Order of Merit, 296.
Hooker's Icones Plantarum, 30.
Hydnum lateritium, *Massee*, 124.
Hypericophyllum, multicaule, *Hutchinson*, 50.
Hypholoma peregrinum, *Massee* (with fig.), 239.

I.

Incarvillea longiracemosa, *Sprague*, 320.
— Younghusbandi, *Sprague*, 320.
"Indian Trees," 30.
Insecta, Lucas (with plate), 401.
Intolwana, 371.
Ipomoea peltata, stem of, 106.
Ire rubber, 187.

Iris verna, 409.
— Wilsoni, *C. H. Wright*, 321.
Isonandra, Malayan species of, 110.

J.

Java teak, 64.
Jodrell Laboratory, research in, 137.
Julianiaceae, 372.

K.

Kaempferia (Soncorus) lutea, *C. H. Wright*, 60.
Kennedya retrorsa, 336.
Kew, a Russian estimate of, 201.
—, Assistant Director, appointment of, 296.
— Gardens, presentations to, 199.
— Herbarium, additions to, 24, 200.
—, heaths, hardy, 101.
—, investigations in plant pathology, 139.
—, Jodrell Laboratory, 137.
— lake, 101.
— Library, catalogue of, supplement to, Appendix II.
— —, presentations to, 27, 200.
—, Lonicera collection, 69.
—, memorial of the late C. B. Clarke, 71.
— Museums, Forestry exhibits, 336.
— —, Guide to museum I., 300.
— —, oils, fatty, in, 106.
— —, presentations to, 106, 199, 336.
—, plant pathology, investigations in, 139.
— publications, 1896–1906, list of, Appendix V.
—, rubber plants, distribution of, 103.
Kew, Tropical African plants, accession of, 233.
—, visitors during 1906, 18.
—, Wild Fauna and Flora, additions to, 97, 156, 238, 282, 401.
Kuntze, Dr. O., 100.

L.

Labrador, plants from, 76.
Lagenaria vulgaris, 300.
Lake, The, 101.
Lamprothamnus Fosteri, *Hutchinson*, 49.
Landolphia Monteiroi, *Dyer Ms. ex Stapf*, 51.
Lepidoptera, Simmonds (with plate). 156.
Leptochloa Appletonii, *Stapf*, 223.
Lilium tigrinum, 297.
Linnean Bicentenary, 251.
Liverpool Botanic Garden, 65.
—, economic notes, 61.
Lomatia ferruginea, 71.
"London Botanic Gardens," 305.
Loniceras at Kew, 69.
Lophira alata, 64.

M.

MacGregor, Sir W., plants from Labrador, 76.
Mahogany, African, 64.
Malay Peninsula, gutta percha, trees of, 109.
— —, Materials for a Flora of, 410.
— —, orchids of, 410.
Mann, Gustav, portrait of, 247.
Margam Park, 390.
Marine algae from Chatham Islands, 37.
Mariola, 293.

Mascarenhasia elastica, 283.
Masters, M. T. (with Bibliography), 325.
Meconopsis bella, 141.
— (Eumeconopsis) Forrestii, *Prain*, 316.
— punicea, 106.
Mgoa rubber in British East Africa, 283.
Mikania scandens in Fiji, 306.
Milowia amethystina, *Massee* (with fig.), 243.
Mimusops, Malayan species of, 117.
Ming-t'ang-shen, 9.
Miscellaneous Notes, 18, 65, 100, 132, 197, 246, 296, 325, 369, 403.
Mitragyne speciosa, 198.
Mollusca, Sich, 282.
Montanoa mollisima, 336.
Montserrat, vegetable products from, 199.
Morocco, Gums Ammoniac of, 375.
Morton, A., 72.
Moupine, Climate, &c., 302.
Mud-binding grasses, 190.
Mud from the Lake, 101.

N.

Naras, 343.
Nerine Bowdeni, 106.
New garden plants, Appx. III.
Newport Forestry Exhibition, 388.
— Public Park, 395.
—, visit to, 388.
N'hangellite, 145.
—, report on a sample from Inhambane, 151.
Nigeria, Northern, notes from, 248.
Noble, C., 403.
Nolanea nana. *Massee*, 123.

O.

Obituary Notices :—
Burdett-Coutts, Baroness, 18.
Buttenshaw, W. R., 404.
Cramer, Major J. T., 404.
Dixon, Abraham, 246.
Foster, Sir M., 65.
Glaziou, A. F. M., 68.
Hanbury, Sir T., 132.
Haviland, G. D., 197.
Kuntze, Dr. O., 100.
Masters, M. T., 325.
Pfitzer, E., 68.
Winter, J. N., 68.
Ocimum (Hierocimum) odontopetalum, *C. H. Wright*, 54.
× Odontioda heatonensis, 200.
Odontoglossum Leeanum, 336.
Oil, palm, 61.
Oils, fatty, collection of, in Kew Museum, 106.
Olearia speciosa, 106.
Omphalia fuliginosa, *Massee*, 122.
— Oedipus, *Massee*, 122.
Oncinotis natalensis, *Stapf*, 52.
Orchids, new, 128.
— of the Malay Peninsula, 410.
— — — North-Western Himalaya, 32.
Orchis longibracteata, flowering of, 144.
Orthopterygium, 372.
Othonna decurrens, *Hutchinson*, 50.

P.

Paenyptila cayanensis, 70.
Paeonia Cambessedesii, 409.
Palaquium, Malayan species of, 113.
Palm kernels, 62.
— oil, 61.
— stem, branching, 106.
Palo amarillo, 294.
Panicum (§Eupanicum) Appletonii, *Stapf*, 225.
Panus Bartlettii, *Massee*, 123.

Paphiopedilum villosum, var. annamense, 140.
Para rubber seeds, transport of, 334.
Parthenium argentatum, 285.
— incanum, 293.
Payena, Malayan species of, 110.
Pearson, H. H. W., notes on a journey from Walfish Bay to Windhuk, 339.
Pedalineae, reductions of Wallichian herbarium, 16.
Peglera, *Bolus*, gen. nov., 362.
— capensis, *Bolus*, 362.
Penllergaer, 394.
Pergularia, The Genus, 323.
Pfitzer, E., 68.
Philippines, Cyperaceae of, 305.
Phyllodoce Breweri, 336.
Pipes, Calabash, 299, 374.
Plant diseases, diagrams of, 202.
— pathology, investigations in, at Kew, 139.
Plants suitable for warmer parts of United Kingdom, 20.
Pleurotus Cheelii, *Massee*, 122.
Podocarpus milanjiana, var. arborescens, 22.
Podophyllum versipelle, 372.
Portuguese East Africa, Report on a sample of N'hangellite from, 151.
Potatoes, degeneration in (with plate), 307.
Primula deorum, 140.
— muscarioides, *Hemsl.*, 319.
— orbicularis, 200.
Prunus Besseyi, 372.
Psalliota Burkillii, *Massee*, 123.
Psychotria Dupontiae, *Hemsl.*, 363.
Pyrenochaeta Phloxidis, *Massee* (with fig.), 241.

R.

Radermachera pentandra, 198.
Ramie in Tirhut, 4.
Ramularia Necator, *Massee*, 243, 298.
Redwood, Sir Boverton, report on a sample of N'hangellite, 151.
Renanthera annamensis, 71.
Rhododendron, a new Chinese, 244.
— Benthamianum, *Hemsl.*, 319.
— Delavayi, 248.
— (§ Azalea) Mariesii, *Hemsl. et E. H. Wils.*, 244.
Rhodophyllis chathamensis, *Cotton*, 40.
Ribes mogollonicum, 106.
Rosa Soulieana, 409.
— Willmottiae, *Hemsl.*, 317.
Rubber, African tree, 187.
— cultivation in the British Empire, 304.
— Exhibition, Ceylon, 34.
—, Guayule, 285.
— in the East, 107
— Ire, 187.
—, Mgoa, in British East Africa, 283.
— plants, American, 153.
— —, distribution of, from Kew, 103.
— tree, new, 294.
—, wet blocking of, 103.

S.

Saccolabium rubescens, 106.
— Woodfordii, *Rolfe*, 131.
Sageretia Brandrethiana, 373.
—, the genus, in Africa, 373.
St. Fagans, 390.
Salix alba, var. caerulea (with plate), 312.
— fragilis (with plate), 312.
— Russelliana, 315.
— viridis, 313.
Sansevieria grandis, 369.
Sapium, 155.
Sarcosperma paniculatum, 109.
Sarcostemma viminale (with fig.), 348.
Sassafras in China, 55.
— officinale, 56.
— Tzumu, 55.

Scinaia complanata, *Cotton*, 260.
Seeds available for distribution, Appx. I.
—, Cacao, treatment for export, 297.
— Cotton, disinfecting, 299.
— from crops of wild ducks, 36.
—, Para rubber, transport of, 334.
Sideroxylon, Malayan species of, 109.
Sikkim, alpine notes from (with plate), 92.
Singleton Abbey, 393.
Smith, W. W., 403.
Somaliland, British, grasses of, 203.
South African Exhibition, plants from, 199.
— — —, economic products from, 199.
South Wales, visit to, 388.
Spartina alterniflora, 192.
— stricta, 190.
— Townsendi, 192.
Specimens for use in elementary schools, 72.
Splachnobryum delicatum, 136.
Sporobolus Brockmanii, *Stapf*, 220.
— fruticulosus, *Stapf*, 218.
— longibrachiatus, *Stapf*, 219.
— variegatus, *Stapf*, 218.
Staffs of Botanical Departments, list of, Appx. IV.
Stauropsis chinensis, *Rolfe*, 130.
— luchuensis, *Rolfe*, 131.
Sterculia rhinopetala, 408.
Stewartia Malachodendron, 336.
Stilbum sphaerocephalum, *Massee* (with fig.), 243.
Streptocarpus Holstii, 337.
Strophanthus Gerrardii, *Stapf*, 52.
Stroud, E. G., 246.
Sudan Gum, 23.
Sugar-canes, seedling in the West Indies, 306, 337.
Swansea Public Parks, 395.
Swedish beer flagons, 106

T.

Tamarix pentandra, 248.
T'ang-shen (with plate), 9.
Teak, Java, 64.
Tillandsia (Anoplophytum) argentina, *C. H. Wright*, 60.
Timbers at Liverpool, 63.
—, African Mahogany, 64.
—, — Oak, 64.
—, Catalpa cordifolia, 43.
—, Java Teak, 64.
—, Washiba, 64.
—, Willow, Cricket bat, 311.
Tirhut, Ramie in, 4.
Tree rubber, African, 187.
Tricuspidaria dependens, 71.
—, synonymy and distribution of, 10.
Trinidad, bird's nest from, 70.
Tropical African plants, accession of, from 1899–1906, 233.

U.

Ulmus campestris, seeding of (with figs.), 404.

V.

Viburnum Carlesii, 71.
Vitex sarawakana, *H. H. W. Pearson*, 60.
— smilacifolia, *H. H. W. Pearson*, 59.

W.

Walfish Bay to Windhuk, notes on a journey (with map and plates), 339.
Wallichian herbarium reductions of :—
— Bignoniaceae ; Pedalineae, 16.
— Cyperaceae, 264.
— Gesneraceae, p. 94.

Washiba, 64.
Welwitschia mirabilis (with plate), 360, 412.
Werneria dactylophylla, a substitute for Coca, 136.
West Indies, seedling sugar-canes in, 306, 337.
Willow, Cricket bat, 311.
Windhuk, 355.
Winter, J. N., 68.
Wrightia natalensis, *Stapf*, 51.

X.

Xylaria hypoxylon, 108.

Z.

Zapupe fibre plant, 396.